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A HAND-BOOK
TO
THE OBSERVATORY.





THE
ASTRONOMICAL OBSERVER.

A HAND-BOOK
TO
THE OBSERVATORY
AND
THE COMMON TELESCOPE.

BY
W. A. DARBY, M.A., F.R.A.S.,
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TO
VICE-ADMIRAL W. H. SMYTH,
K.S.F., D.C.L., F.R.S., F.R.A.S., &c.
IN TESTIMONY OF
THE EMINENT SERVICES HE HAS RENDERED TO
ASTRONOMICAL SCIENCE,
This Volume,
SO LARGELY INDEBTED TO
"THE BEDFORD CATALOGUE,"
IS GRATEFULLY INSCRIBED
BY
THE AUTHOR.

INTRODUCTION.

"Mysterious Night! when our first parent knew
Thee from report divine, and heard thy name,
Did he not tremble for this lovely frame,
This glorious canopy of light and blue?
Yet, 'neath a curtain of translucent dew,
Bathed in the rays of the great setting flame,
Hesperus with the host of heaven came,
And, lo! Creation widen'd in man's view.
Who could have thought such darkness lay conceal'd
Within thy beams, O Sun! or who could find,
Whilst fly, and leaf, and insect stood reveal'd,
That to such countless orbs Thou mad'st us blind!
Why do we then shun death with anxious strife?
If light can thus deceive, why may not life?"

THE history of Astronomical Science is probably coeval with the history of man. The unrivalled splendour of the night sky would naturally awaken interest, that interest would induce observation, and observation would soon inculcate the leading principles of astronomy. If Adam wept, as poets tell us, when he beheld the first sunset, his sorrow must have been very soon turned into joy at the appearance of Sirius, "monarch of the suns," with his heavenly host. Josephus asserts that "God indulged the antediluvians with a very long life, in order that they might bring astronomy and geometry to perfection;" and that "Abraham was a most intense observer of the stars, and the first to bring astronomy from Chaldea into Egypt." Job certainly possessed an intimate knowledge of the heavens, for this is implied in the questions addressed to him by the Creator, "Canst thou bind the sweet influences of Pleiades, or loose the bands of Orion? Canst thou bring forth Mazzaroth in his season? or canst thou guide Arcturus with his sons? Knowest thou the ordinances of heaven? canst thou set the dominion thereof in the earth?"—Job xxxviii. 31—33. David was an observer of the heavens, and composed some astronomical hymns (Psa. viii. and xix.) for the services of the Temple; Isaiah exhorted the Hebrews to a contemplation of the starry firmament as a ground of confidence in God: "Lift up your eyes on high, and behold who hath created these things, that bringeth out their host by number. He calleth them all by names, by the

greatness of His might, for that He is strong in power, not one faileth.”—Isaiah xl. 26. Homer sang of “the Pleiades, and Bootes, and bold Orion, the Bear, the unwearied Sun, the full Moon, and all the Stars, by which, like a crown, the heavens are surrounded.”—*Odyssey*, lib. v.

To Egypt, the oldest of the nations, belongs the honour of producing the most eminent astronomers of ancient times. Pythagoras, Euclid, Archimedes, Erasthenes, Ptolemy, and Hipparchus, were all of the Alexandrian School. Pythagoras (B. C. 580) discovered the true system of the universe. He taught that “the seeming irregularities of the heavenly bodies might be simply and correctly explained, if it could be shown that the earth was a solid globe rotating on an axis, and at the same time revolving in a circular orbit around the sun.” This doctrine was maintained by the followers of Pythagoras for above 700 years, until it was opposed by Ptolemy. Euclid (B. C. 300) and Archimedes (B. C. 200) laid the foundations of geometrical mensuration, by which astronomical observation became elevated to the rank of a regular science. Erasthenes (B. C. 275) first observed the obliquity of the Ecliptic, and discovered the method of measuring the circumference of the globe. Hipparchus (B. C. 150) the most eminent among the ancient astronomers, “the patriarch of astronomy,” and the first who treated the science in a philosophical manner, discovered the precession of the equinoxes, calculated the eclipses, determined the revolutions and mean motions of the planets, numbered and catalogued the fixed stars, and laid the foundations of geographical and trigonometrical science. Ptolemy erected an observatory at Alexandria (about A. D. 120); he corrected the catalogue of Hipparchus, formed tables of the planetary motions, collected the scattered observations of the ancients, and devised a new system—that the earth was the great centre of the universe, around which the sun, moon, and planets revolved. This doctrine became ultimately dominant for 1,400 years, until Copernicus (A. D. 1540), restored the ancient system of Pythagoras. Tycho Brahe (A. D. 1546—1601), before the discovery of the telescope, became the founder of the modern school of observational astronomers. Kepler, his contemporary, discovered the three laws of planetary revolution:—

I.—The orbits of the planets are not circles, but ellipses, having the sun in one of the foci.

II.—The revolving body describes on the plane of its orbit equal areas in equal times.

III.—In the revolution of the planets and their satellites, the squares of the times of their periodical revolutions are as the cubes of their distances. These laws are purely geometrical—they have been affirmed by all subsequent observation, and they abundantly demonstrate the truth of the old saying, “God works by geometry.”

Galileo (A. D. 1564—1642) discovered the telescope,—or first directed it to the heavens, and by his observations and writings securely established the

Copernican system of the universe. Huyghens (A. D. 1629—1695) improved the telescope, added pendulums to clocks, whereby the correct measurement of time and a knowledge of the spheroidal figure of the earth was obtained. He discovered that the singular appearance of Saturn, which so puzzled Galileo, was caused by a flat ring inclined 30° to the plane of the ecliptic, and observed one of the satellites, as recorded in his "Systema Saturnium."

Sir Isaac Newton (A. D. 1642—1727) found astronomy almost a chaos of conflicting principles; his discovery of the great law of attraction, left it a perfect system of order, beauty, and harmony. That law is—"That the centres of all bodies are attracted towards each other directly as the quantity of matter, and inversely as the square of their distances." Leibnitz said of Newton, "Taking mathematicians from the beginning of the world to the time when Newton lived, what he had done was much the better half." Laplace said, "The discovery of that simple and general law, by the greatness and the variety of the objects which it embraces, confers honour upon the intellect of man,"—"the *Principia* of Newton will ever remain a monument of the profoundest genius, which revealed to us the greatest law of the universe." Some of the most important philosophical and astronomical discoveries which have been made in this and other countries, since the time of Sir Isaac Newton, are now acknowledged to be the legitimate results of the doctrines propounded in the *Principia*. Several of Newton's theories have been verified in a remarkable manner 60 to 100 years after his death.

A new era in practical astronomy was introduced by many eminent observers towards the close of the last century, among whom were Messier, Sir William Herschel, Piazzi, and Struve. Messier is chiefly known by his famous catalogue of 103 nebulae (A. D. 1784). Sir William Herschel constructed large reflecting telescopes, observed and catalogued 500 double stars, discovered the binary systems of double stars, and above 2,500 new nebulae, which he arranged in several catalogues, in eight classes—Bright Nebulae, I.; Faint Nebulae, II.; Very faint Nebulae, III.; Planetary Nebulae, IV.; Very large Nebulae, V.; Very compressed and rich clusters of Stars, VI.; Compressed clusters of large and small Stars, VII.; Coarsely-scattered clusters of Stars, VIII. Professor Struve was a distinguished observer of double stars. The results appear in his celebrated Catalogue, wherein the double stars are classed according to their distances. 1st class, $0''$ — $1''$; 2nd, $1''$ — $2''$; 3rd, $2''$ — $4''$; 4th, $4''$ — $8''$; 5th, $8''$ — $12''$; 6th, $12''$ — $16''$; 7th, $16''$ — $24''$; 8th, $24''$ — $32''$. Sir John Herschel conferred inestimable benefits on astronomical science by his observations in both hemispheres, augmenting very greatly the lists of nebulae and of double stars (see his "*Catalogue*, 1834;" "*Results of Astronomical Observations at the Cape of Good Hope*, 1834-8;" "*Outlines on Astronomy*"). Admiral Smyth contributed largely to the advancement of observational astronomy by his "*Cycle of Celestial Objects*," a work of unrivalled interest to the amateur observer, embracing the principal nebulae

and clusters of the catalogues of Messier, of Sir William and Sir John Herschel, with most of the sidereal objects of the catalogues of Piazzi and Struve, enriched by a vast number of original observations, extending over a period of 25 years, and continued in his recent work, *Speculum Hartwellianum*.

The Earl of Rosse constructed, at vast labour and expense, the 6-feet reflecting telescope hitherto unrivalled, in illuminating and space-penetrating power. He observed 980 nebulae (see *Philosophical Transactions*, 1862), and discovered the spiral and other nebulae of extraordinary configuration. When the *spiral* character was first announced, some of the astronomical *savans* of the old school sceptically shook their heads, insinuating—"Spiral! hem! rather say, coil-tracings left on the face of the speculum by the grinder, or the polisher!" Nevertheless, the existence of spiral universes was established, and Nature was caught in the very act of giving some of them a rotatory motion on their axes (see 97 M. p. 94, and 60 M. p. 99). "14 spirals have been discovered in 1850, besides other nebulae, in which indications of the same character have been observed, but they are still marked 'doubtful' in our working list. 51 Messier is the most conspicuous of this class." "The 6-feet aperture brings out the characteristics of 51 M. so strikingly, that I think, on a very fine night, considerably less power would suffice to bring out its convolutions." *—(Lord Rosse.) To Lord Rosse belongs the honour of resolving

* The following letter to the Editor of the *London Review* (October 18, 1862), is here reproduced, in vindication of the observations of Lord Rosse:—

SIR,—In the *London Review* of May 10th, 1862, I find a notice of the proceedings of the Academy of Sciences as follows:—"M. Le Verrier exhibited a drawing of the double nebula in the Northern Canes Venatici, as seen in M. Foucault's 80-centimetre telescope, showing incomparably more details than the similar drawings of Herschel and Lord Rosse. The spirals and whorls of the nebulous matter are perfectly defined; and it is seen, moreover, that the centres of the two whorls are occupied by two stars."

I find, also, in Number VI. of the *Intellectual Observer*, a report of the remarks of M. Chacornac, on presenting a drawing of the same nebula, seen with the Foucault reflector, in which he observes—"We must first notice the stellar appearance of the luminous centres of this double nebula, and observe that the central luminosity of the greatest of them has, under high magnification, the appearance of a whirlpool of little stars environing a principal star, which has not the planetary character indicated by Lord Rosse. These stars, of which those nearest the centre are seen through a nebulous veil, are not the only novelties, for as many as nine are distributed in the whorls of the great nebula, and which are not shown in the drawings of Lord Rosse. In addition to these objects, of which I hope to discover more, I would call attention to divers branches of the spiraloid nebula as crossing each other in a different manner. The configuration of the most brilliant of spirals, as indicated in our drawing, establishes the accuracy of the representation given by Sir J. Herschel. The branch which ties the smaller to the greater nebula cuts the two principal spirals of the latter near the places where these branches cross in such a way that the interlacing of the curves presents the aspect of a spherical triangle. The companion nebula itself exhibits a spiral form, and not the appearance of a planetary disc surrounded by a uniformly distributed atmosphere." The editor of the *Intellectual Observer* adds—"In a communication with which we have been favoured by M. Chacornac, he informs us that he does not

into stars a portion of the great nebula in Orion—a discovery which seems to have effected a complete revolution in the theories of some astronomers concerning the constitution of many of the nebulae; proving that those mysterious clouds are not nebulous matter in process of condensation into stars, but each

intend to compare the Foucault telescope in point of power with the giant of Parsons-town. This observation of the distinguished astronomer has reference to the remarks made in our last number." The obligations which astronomers owe to the Earl of Rosse for his munificence, labours, and discoveries, as well as the general interests of astronomical science, demand that the report of M. Chacornac should be fully examined.

As to the power of the Foucault telescope. This reflector is composed of a casting of glass, polished and silvered according to M. Liebig's process. The reflective power, of pure silver, according to Steinhil's experiments (the originator of the principle of Foucault's reflector), is to that of the best speculum metal alloy as 91 to 67, or as 1.36 to 1. This calculation would still leave an enormous surplus of reflective power (4 to 1) in favour of the Rosse reflector.

M. Chacornac states,—1. That Lord Rosse's drawing of the great spiral indicates a "*planetary character*" in the centres; and again, "a planetary disk surrounded by a uniformly distributed atmosphere." This is not correct; neither the *observations* of Lord Rosse, nor the *drawing* given by him in the *Philosophical Transactions* for 1850, give any such indications.

2. M. Chacornac claims it as a "*novelty*," in the revelations of his telescope, that he observed a *stellar appearance* of the luminous centres of the nebula; but Lord Rosse discovered this novelty eighteen years ago, and that, too, with his smaller telescope. "April 11th, 1844.—Observed with the 3-feet instrument, two friends assisting; both saw centre clearly resolved." A good $3\frac{1}{2}$ -inch aperture achromatic refractor and a fine eye, on a clear night, will readily show stars glittering on the surface of both the nuclei of 51 Messier, more especially on the surface of the smaller, which is the brighter, and will also show a faint luminous atmosphere surrounding for some distance the principal nucleus; the non-planetary and stellar character of the nuclei cannot therefore be regarded as any remarkable achievement of the 36-inch Foucault mirror.

3. M. Chacornac claims "*the spiral character*" of the stars of the centre as a new "discovery." Lord Rosse records, "April 26th, 1848.—Six-feet instrument, saw the spirality of the principal nucleus very plainly; saw also the spiral arrangement in the smaller nucleus." In one particular M. Chacornac, however, admits *inferior definition*, for he acknowledges, "those stars nearest the centre are seen *through a nebulous veil*." Lord Rosse, it appears, saw them *very plainly*.

4. M. Chacornac presumes on another "discovery" in observing "as many as nine stars distributed in the whorls of the great nebula, and which are not shown in the drawings of Lord Rosse." If M. Chacornac had examined the original engraving of 51 Messier, as given in the *Philosophical Transactions*, he might have seen as many as *fifteen* stars numbered in the convolutions of the nebula, and the measures tabulated in the observations annexed, even with the 3-feet reflector. "September 18th, 1843.—Observed with the 3-feet telescope, power single lens, 1-inch focus, a *great number of stars* clearly visible in the nebula."

5. M. Chacornac continues—"In addition to these objects (the nine stars), of which I hope to discover more," &c. It is a pity M. Chacornac did not consult Lord Rosse's observations before making his report to the Academy, he would have found that there remained a very wide margin ere he arrived at the point of actual *discovery*. "April 26th, 1848.—No stars were inserted in the sketch which are not in the table of measurements; the general appearance of the object would have been better if the minute stars had been put in from the eye sketch, but it would have created confusion. On the finest night we see the convolutions (of the nebula) breaking up into stars,—the exceedingly minute stars cannot be seen steadily, some of the stars are so bright I

an "Island Universe," just like unto our own system, as, indeed, was taught by Huyghens, in 1680. "Whatsoever other objects have been called *nebulae*, and even the Milky Way, when looked at through telescopes, show nothing nebulous, and are merely multitudes of stars crowded together."

The Telescope is the first of all instruments. The Microscope brings up the minute world of Nature, and astonishes us with evidences of the Divine wisdom, power, and goodness, far away down into what we have often considered veritable nothingness, and at every step down we are startled into amazement to discover and explore world on world of new creatures—our fellow-creatures! having systems of being and performing functions analogous in some respects to our own or to other creatures around us, and we gaze and wonder and adore the Creator. "The eyes of all wait upon thee, and thou givest them their meat in due season." The microscope has to do with earth, our home, with the universe below us. The telescope has to do with celestial worlds: it takes us from home

have little doubt that they would bear illumination. The nebula itself is pretty well studded with stars, which can be distinguished of various sizes. Of a few of those, with reference to the principal nucleus, measurements were taken."—*Lord Rosse's Observations*.

6. M. Chacornac describes "the divers branches of the spiraloid as crossing each other in a different manner," *i.e.*, different from the representation of Lord Rosse. Lord Rosse states that he observed the nebula twenty-eight times before making the sketch, and with both telescopes, and that "this nebula was seen by a great many visitors, and its general resemblance to the sketch was at once recognised, even by unpractised eyes." Finally, the drawings of this and other extraordinary *nebulae* have long since been affirmed by many of the most eminent astronomers in various parts of the world.

7. M. Chacornac intimates very plainly his *preference* for the figure of 51 Messier as given by Sir J. Herschel. Sir W. Herschel figured 51 Messier as a double nebula, the larger having a distant ring, halo, or glory around it. Sir J. Herschel improved his father's figure by showing the ring split into two sections, like the *Via Lactea*, for about 90° of the circumference; still there was no indication of the *spiral character* until Lord Rosse's discovery, yet M. Chacornac, strangely enough, speaks of "establishing the accuracy of the representation (of 51 M.) as given by Sir John Herschel!" "Sept. 18, 1843.—Observed with the 3-feet instrument, power single lens, 1-inch focus, a great number of stars clearly visible in it, *still Herschel's rings not apparent*, at least, no such uniformity as he represents in his drawing."—*Lord Rosse's Observations*.

From all this it may be fairly concluded that neither M. Le Verrier, the Abbé Moigno (who also endorses the report), nor M. Chacornac could have seen the engraving of the drawing of Lord Rosse of 51 Messier, or the accompanying observations in the *Philosophical Transactions* for 1850 (which must be found in the Library of the Academy of Sciences); probably these astronomers have been misled by some imperfect copy of the great spiral, and have thus unwittingly arrived at a series of erroneous conclusions concerning the drawing and observations of Lord Rosse.

We await with interest the publication of the drawing of 51 Messier presented to the Academy of Sciences by M. Chacornac, and in the meantime we call the attention of the astronomers who may be fortunate enough to possess large reflectors on the new principle of M. Foucault, to two other great spiral *nebulae* lately observed and sketched by the Earl of Rosse (see *Philosophical Transactions*, 1862), 101 Messier, R. A. 13h. 58m. 24s., N. D. 55° 1' 0"; and 33 Messier, R. A. 1h. 26m. 15s., N. D. 29° 59' 5". They will be found fine test-objects for the definition and the space-penetrating power of the new telescope.—I am, Sir, your obedient servant, W. A. DARBY, M.A.

to the universe above us. We visit by its aid the worlds of our solar system, and are astonished at the striking analogy some of them bear to our own—travel along the Milky Way, and are bewildered to find its stratified star-dust composed of suns,—doubtless the centres of systems—watch the revolutions of the binary systems—double suns of different-coloured-light from ours; penetrate the great star-clusters—away through depth and height, through space, grand, awful, incomprehensible to those wonderful nebular regions, clouds of suns, millions on millions, condensed into apparent solidity by their vast distances; globes, ovals, spindles, rings, cones, planes, coils, spirals, universe after universe, until oppressed with splendour, overwhelmed with the immensity of creation, and dumb with astonishment, we adore the Creator. “O Lord, how manifold are thy works; in wisdom hast thou made them all.”

In 1845, Sir James South made trial of the telescope of Lord Rosse, and observes:—“Never before in my life did I see such glorious sidereal pictures as this telescope afforded us. The most popularly known *nebulæ* observed were the ring-*nebula*, resolved into stars with a magnifying power of 548, and the 94th *nebula* of Messier’s List, resolved into a large globular cluster, not much unlike the well-known cluster 13 Messier, in Hercules. On subsequent nights observations of other *nebulæ*, amounting to some 30 or more, removed most of these from the list of *nebulæ* where they had long figured, to that of clusters; while some of the clusters exhibited a sidereal picture in the telescope, such as man had never seen before, and which for magnificence baffles all description.” “The sublimity of the spectacle,” observes Sir John Herschel, “afforded by the magnificent reflecting telescope constructed by Lord Rosse, of some of the larger globular and other clusters, is declared by all who have witnessed it, to be such as no words can express. This telescope has resolved, or rendered resolvable, multitudes of *nebulæ* which had resisted all inferior powers.”

The great progress of Practical Astronomy in this country may be fairly estimated by the rapid increase in the number of Private Observatories. By a tacit understanding between the professional and the amateur astronomers, those observatories are expected to be devoted chiefly towards the following objects:—

1. Observation of the solar spots, and other phenomena of the Sun’s disc.
2. Observation of the Moon, with especial reference to indications of change on her surface.
3. Occultation of stars by the Moon.
4. Eclipses of the heavenly bodies.
5. Observations of the Planetoids.
6. Cometary observation.
7. Mapping of the small stars and the minute double stars not included in the catalogues.
8. Observations on the positions and distances of the catalogued double stars.

9. Observations on the known binary stars.
10. Observations on the nebulæ.
11. On the indications of change, or variability in certain of the bi-central or double nebulæ.
12. Observations on the variable stars.

The following catalogue is chiefly a compilation from the catalogues of Sir William and Sir John Herschel, the "Bedford Catalogue" of Admiral Smyth, and the Catalogue of Nebulæ of the Earl of Rosse (*Philosophical Transactions*, 1850—1862). Notices of observations have been gleaned also from the "Celestial Objects" of the Rev. T. W. Webb, M.A., F.R.A.S., the Catalogues of Double Stars of George Bishop, Esq., F.R.A.S., the Rev. W. R. Dawes, F.R.A.S., and other sources.

The design of the Author has been to furnish a comprehensive catalogue of telescopic objects for the observatory of the amateur astronomer, who may possess a good equatorially-mounted telescope,—still almost exclusively the privilege of the wealthy; and to accommodate, as far as possible, to a non-equatorial telescope, the major part of the catalogued objects, aided by the large Maps of the Society for the Diffusion of Useful Knowledge, so that they may be readily found with a plain telescope, the stars visible to the naked eye serving as pointers to the invisible telescopic objects. To give an instance of an object of each class,—nebula, cluster, and double star:—

31 Messier.—The great nebula in the constellation of Andromeda. It is required, to find it with a telescope mounted on a plain stand. A line drawn on the Maps, or an imaginary line drawn in the heavens from the star β Andromedæ, over the star μ Andromedæ, and produced as far again beyond, will place the nebula in the field of the telescope, with a low-power eye-piece.

33 H. VI. and 34 H. VI.—The splendid bi-central cluster in the constellation of Perseus. The position of this double cluster is indicated by two of the principal stars in the neighbouring constellation of Cassiopea. A line from γ Cassiopeæ projected over the star δ Cassiopeæ, and produced twice the distance beyond, will strike a point just to the north of the object, depress the telescope half a degree, and the cluster is in the field.

ϵ 4 and ϵ 5 Lyræ.—An exquisitely beautiful quadruple system; "a double-double-star." It is found at the northern and following vertex of a nearly equilateral triangle visible to the naked eye formed by the great star Vega, (α Lyræ), ζ Lyræ, and the object desired. Place the telescope at the upper angle, and the two stars are in the field. A higher power eye-piece will be required to separate each star into a twin pair of golden suns.

The difficulties felt by the observer at the outset in this mode of observation gradually disappear in practice, while at the same time he acquires an intimate knowledge of the visible heavens, of great importance to his future career as an astronomer. Many eminent observers have thus attained to such familiar acquaintance with the starry firmament that they rarely proceed to find their

objects by the graduated circles of the equatorial, except in regions of the heavens blank to the naked eye. It has been said of Sir William Herschel, that he knew almost every star down to the 6th magnitude by name, Greek letter, Arabic numeral, or other designation. This method of observation is the only one available to the observer with a plain stand: fortunately for him, a large proportion of the objects of the catalogues, nebulae, clusters, and double stars, are thus accessible.

It will greatly facilitate this off-hand mode of finding the celestial objects, if the stand of the telescope be constructed of the kind called *parallactic*, possessing a polar axis, inclined to the elevation of the pole, at the latitude of the place. By the use of slow-motion handles, a star may be constantly kept in the field of the telescope. If two wheels be attached, one a fixture on the polar-axis, and the other on the telescope-axis, each wheel cut into 360 teeth, then, every turn of the pinion which works in those teeth will move forward or backward one tooth; *i.e.*, each turn of the handle will move the telescope *one degree* in Right Ascension, or in Declination, and of course, half a turn will measure half a degree, the telescope-axis wheel in the Declination, and the polar-axis wheel in Right Ascension. Now, as very many of the nebulae, clusters, or double stars, are located close to some pointer-star, it is manifest that this accurate mode of measuring short distances from half a degree up to five or six degrees will enable the amateur observer readily to find those objects. In especial reference to this *modus operandi*, and in order to avoid confusion, the relative distances of the stars, one from another, or of the telescopic object from a certain star, are always expressed in *degrees* or in parts of a degree, in the directions for the finding of the several objects, both in Right Ascension as well as in Declination, and the arc of the Meridian or Declination is termed the parallel of Declination, corresponding with the parallel of Right Ascension.

The Catalogue has been especially prepared with reference to the large Maps of the Society for the Diffusion of Useful Knowledge: the possession of those Maps is essentially necessary to the use of the Catalogue by the observer with a non-equatorial telescope. Malby's 36-inch Globe Atlas has been used as a standard of reference for the more exact determination of distances in the positions of the nebulae and star-clusters, and Malby's Globe (18-inch, 1858) has been extensively consulted in reference to the positions of the stars. Notwithstanding the great accuracy and excellence of the Maps S. D. U. K., considerable distortion in the scale of distances exists at the corners, and must necessarily exist in all celestial maps not constructed on the sectional or globe principle.

The great service rendered to the cause of practical astronomy by the constructors of celestial maps and globes has never been sufficiently appreciated and acknowledged. The maps S. D. U. K., the Globe Atlas, and Globe, just noticed, are the result of prodigious labour, and are wonderfully comprehensive, accurate, and beautiful. Some unimportant errors, mistakes, and omissions, are noticed in the Catalogue.

The value of the Globe Atlas would be greatly enhanced to the observer with an ordinary telescope, if the Maps were constructed with the *front view* of the heavens as in the Maps S. D. U. K., *not* with the obverse view, such as is usually given on the celestial globe. A good set of portable constellation charts, showing the principal nebulae of the catalogues of Sir William and Sir John Herschel, and of Messier, together with the stars of Flamsteed's and Piazzi's Catalogues, indicating very plainly the double and multiple stars, and giving the front view of the heavens, is still a *desideratum* to the rising race of astronomical observers.*

It is important to the amateur observer to learn the *names* of as many of the principal stars as possible; they are his landmarks in the celestial regions, and he becomes more familiar with them under a proper name than under the designation of a Greek letter or Arabic numeral. Sirius is a more ancient, pronounceable, rememberable, and suitable name for everybody's mouth, than Alpha Canis Majoris; Vega (or Wega), than Alpha Lyrae; Capella, than Alpha Aurigae; Arcturus, than Alpha Bootis; Alpherat, than Alpha Andromedae; Regulus, than Alpha Leonis, &c. Some pains have been taken in the Catalogue to fish up the names of the leading stars from old books, catalogues, charts, and globes. There are three or four Mirachs, the same number of Denebs, &c. Much remains to be done before the nomenclature of the stars can be placed in a satisfactory state.

The boundaries of the *constellations* are in a very discreditable state of confusion. Mr. Baily, in his edition of Flamsteed, made an important movement towards a readjustment;—who will follow it up to completion? Perhaps no living authority could interfere with more certainty of success to reduce this chaos into order and harmony, than Sir John Herschel, whose knowledge of the heavens in both hemispheres especially qualifies him for the work.

The Right Ascensions and Declinations of the objects have been brought up to the year 1865, according to the *formulæ* of the *Bedford Catalogue* and the *British Association Catalogue*; where there has been found a difference in the result, the *Bedford Catalogue* has been followed.

As the stars move—or *appear* to move—east to west, west to east, occasioned by the diurnal motion of the earth from west to east, east to west, the observer must remember that the terms "*preceding*" (*p.*) and "*following*" (*f.*) in the Catalogue, indicate on the Maps S. D. U. K., or in the heavens,—*p.* right hand; *f.* the left hand. This order is reversed on the Globe or Globe Atlas, which has the back-view. Care must be taken not to confound the symbols *p.* (preceding), *f.* (following), *n. p.* (north preceding), *s. p.* (south preceding), *n. f.* (north following), *s. f.* (south following), with the same terms on the *Diagram* for observing the double stars; for, in the latter case, all these terms are *reversed*, occasioned by the *inverting* eye-piece of the astronomical telescope. If an

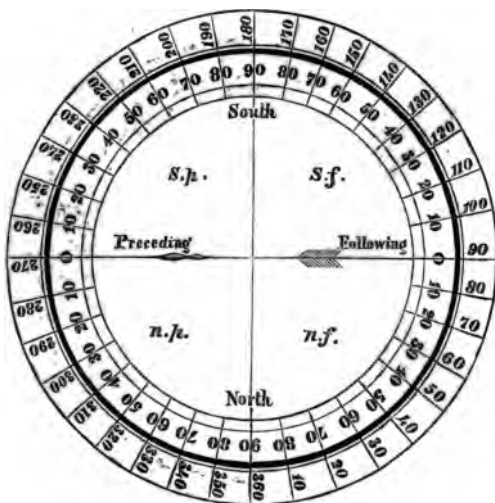
* A set of Celestial Charts of this character is in course of preparation, adapted to the Catalogue given in this work, and especially designed for the common telescope.

erecting or terrestrial eye-piece were in use, the terms would be identical, for the stars would then enter the field of view on the left hand, pass over, and disappear on the right hand. Bearing in mind the effect of the inverting astronomical eye-piece, when considering the diagram, all confusion is avoided, and the terms are identical in signification. The observer is supposed to use the *front-view* Maps; but if he use the Globe Atlas Maps, or Globe, then preceding, following, &c., have the same reference as in the double-star diagram.

H. is the symbol for Sir William Herschel; H. Sir John Herschel; M. Messier; P. Piazzi's Catalogue; P. XIII. Piazzi's XIIIth hour of Right Ascension—as he observed and catalogued his objects, not by constellations, as in the following Catalogue, but in the order of Right Ascension; Σ Struve, the author of the Dorpat Catalogue of Double Stars; R. A. Right Ascension; N. D. North Declination; S. D. South Declination.

The double stars are distinguished—1st, by their designating Greek letter, if there be one assigned; 2nd, by their Flamsteed's number or Arabic numeral; 3rd, by their names, if any be found on the Catalogues or Maps; 4th, by the Right Ascension and Declination; 5th, by their magnitudes and colours, the great star being distinguished by the italic *a*, the companion or companions, *b*, *c*, or *d*—in the case of multiple stars, where there are a greater and lesser *a*, they are distinguished by a larger and smaller type; 6th, the distances,—thus, dist. *a*—*b* 3".1, or, if the distance be difference of the objects in Right Ascension, "diff. in R. A. 3".1."

Sir John Herschel's mode of observing and registering double stars will be understood from the following diagram:—

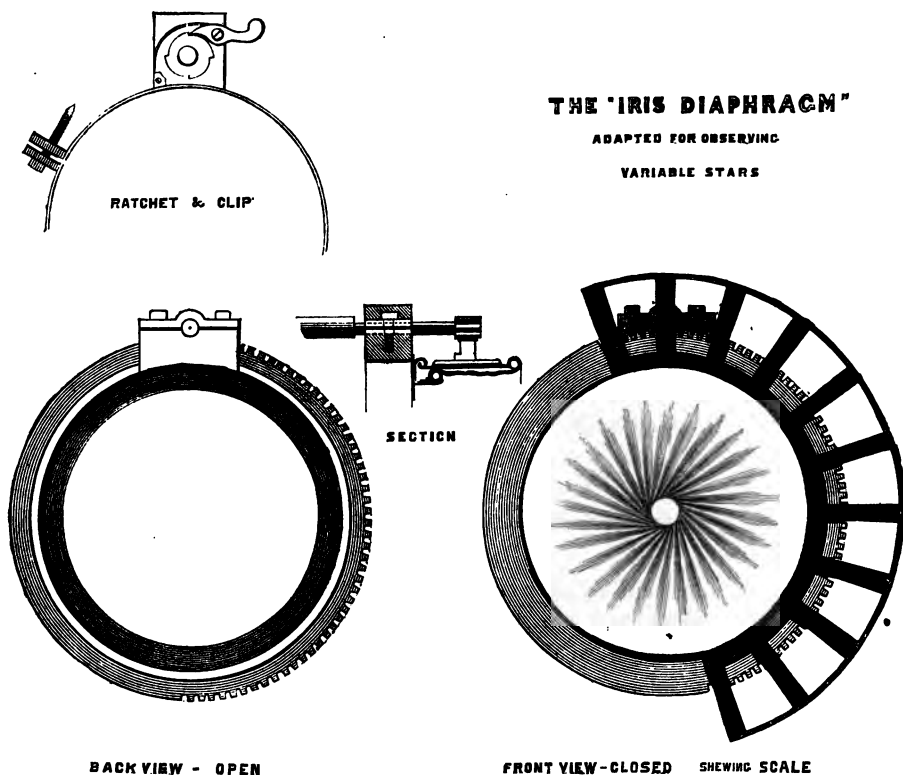


The inner circle shows the inverted field of the telescope, with the spider-lines in the eye-piece. If the principal star of the components of a double star be

placed in the centre, the companion will occupy some relative position, the angle of which is accurately defined by the subdivisions of the circle. (See description of the micrometer in Lardner's and Chambers's Hand-books to Astronomy.) Sir William Herschel first introduced the custom of reading by *quadrants*; but the method recommended by Sir John Herschel is now considered more simple and convenient. Both are represented in the diagram. The readings are reckoned on the outer circle, beginning at North, or 360 (which is the 0, or *zero*), and continued round in the direction *n. f.* (north following), *s. f.* (south following), South, *s. p.* (south preceding), *n. p.* (north preceding).

The methods of observing the *Variable* stars are the following:—1st. By two telescopes of different aperture; 2nd, by one telescope with a divided object-glass; 3rd, by Sir John Herschel's rectangular prism astrometer (see 3,320, Dr. Lardner's Handbook of Astronomy); 4th, by a series of "limited" or "reduced" aperture-caps for the telescope, first used by the Rev. W. R. Dawes (see Monthly Notices of the Royal Astronomical Society, vol. x. p. 187).

The following cut will explain the construction of the "Iris Diaphragm":—



An improved diaphragm on the principle of a diminishing aperture-cap, under the entire control of the observer, and regulating the aperture by an index

gradually to extinction, has been recently adapted by Mr. Alfred Brothers, F.R.A.S. It was exhibited at the Literary and Philosophical Society of Manchester, April 7th, 1863, and has been in successful operation during the last year by Mr. Baxendell, in his observations of variable stars, at the observatory of Robert Worthington, Esq., F.R.A.S., Crumpsall, Manchester.

“When apertures of various diameters are used as diaphragms, placed at the end of the dew-cap of large telescopes, and particularly of refractors, it must at all times be difficult to make these changes, even when the advantage of clock-work motion is available; but with telescopes whose motions must be controlled by hand, the possibility of determining with accuracy such results as the one-tenth of a magnitude must be very uncertain; for, unless an assistant be at hand to change the diaphragms during the observation, the observer must be constantly liable to lose the star at the moment it becomes necessary that it should be in the centre of the field of view, and the eye in a position to note the effect produced by the decrease of light on the change of diaphragm being effected. Several contrivances have been adopted to contract the aperture of the telescope, such as square and hexagonal forms, opened and closed mechanically; but hitherto, it is believed, no diaphragm has been constructed which retains the *circular* form of the aperture.

“The *invention* consists of two rings of metal, one working within the other, of nearly the same diameter, but differing in width, to the outer edges of which is attached a piece of sheet india-rubber joined at the ends, and so placed that when the rings are moved in opposite directions, the india-rubber is stretched, and closes the aperture of the rings when they have made about one-half of a revolution. The aperture remains circular, or nearly so; its perfect circularity depends on the proper attachment of the india-rubber.

“The *adaptation* is effected in the following manner. A flat ring of tin with a flange is made to fit accurately on the end of the dew-cap of the telescope. The diaphragm is soldered to the flange; a circle of brass is fixed to the broader ring of the diaphragm, having teeth cut rather more than one-half round its circumference. On the ring, which is attached to the dew-cap, is a bearing for a small pinion, which gives motion to the half-wheel by means of a slender rod (of brass tubing) the length of the telescope, having a handle of convenient form, worked by the left hand. The rod is supported at the tail-piece end of the telescope, on a bearing attached to a metal collar made to clip the telescope by a screw, and attached to this bearing is a ratchet-wheel, which prevents the too rapid reverse motion of the india-rubber diaphragm.

“It is not considered necessary to give the dimensions of the parts of the apparatus, as in every case these must vary with the diameter of the object-glass of the telescope. The principal point to be attended to is the width of the broader ring, which is covered inside by the india-rubber; and this should be sufficiently wide to close the aperture when in use. Stops are placed at each

end of the teeth on the half wheel, to prevent the over-winding of the diaphragm.

"An index of some kind is necessary to make the apparatus complete. A pointer might be fixed on the end of the dew-cap, and a scale to project from the wheel. The diameter of the various openings could also be determined by the ear, the number of teeth in the wheel and pinion being known, the ratchet-wheel could be so adapted, that a certain number of *clicks* would indicate that a certain aperture is then in use. This method, however, might be tedious to the observer, owing to the necessity for counting. The index and scale will perhaps be more convenient, and if the light from the sky should not be sufficient to show the reading of the scale, the micrometer lamp could be placed so as to illuminate the scale and index only.

"The additional weight at the end of the telescope renders a counterpoise necessary, and this is effected by a slight addition to the usual counterpoise."

The following description of the Adjustments and Use of the Equatorial Telescope may be useful to the amateur observer :*—

"1. The polar axis must be elevated to the altitude of the pole.

"2. The index of the declination-circle must point to zero when the line of sight or collimation is parallel to the equator.

"3. The polar axis must be brought into the meridian.

"4. The line of collimation of the telescope must be perpendicular to the declination axis.

"5. The declination axis must be perpendicular to the polar axis.

"6. The index of the hour-circle must point to zero when the telescope is in the meridian of the place.

"*First Adjustment.*—Observe the polar distance of any known star when near the meridian, and then, turning the polar axis half round, observe the same star again. Take the mean of the two observations, which is the distance of the star from the pole of the instrument; correct it for refraction, and compare the result with the true north polar distance given by the Nautical Almanac. If the star is above the pole, and the instrumental exceeds the true polar distance, the pole of the instrument is below the pole of the heavens, and *vice versâ*. Correct this error by the proper screws for raising or depressing the polar axis.

"*Example.*—When ϵ Ursæ Minoris was near the meridian, its north polar distance was observed to be $7^{\circ} 44' 7''$, the face of the declination-circle being west; and $7^{\circ} 44' 40''$ when the face of the circle was east.

"The mean of these two observations is $7^{\circ} 44' 23''.5$; the refraction was $52''.8$;

* Much valuable information concerning the construction of the achromatic telescope with its various mountings, and especially of the *equatorial*, may be obtained from valuable works on the subject by William Simms, Esq., F.R.S., F.R.A.S., &c., and "A Handbook of Astronomy," by G. F. Chambers, Esq., F.R.G.S., &c.

making the corrected polar distance $7^{\circ} 43' 30''\cdot7$. The polar distance by the *Nautical Almanac* was $7^{\circ} 42' 40''\cdot7$. Hence the polar axis was $50''$ too low. The refraction is derived from the Table on page xxix.

“Second Adjustment.”—Take half the difference of the above two observations; this will be the index error of the declination verniers, and they must be moved accordingly by their adjusting screws. Several pairs of observations should be taken, in order to ascertain these errors with great accuracy.

“Example.”—According to the observations above given, the index error was $16''\cdot5$, to be added to observations when the circle is west.

“Third Adjustment.”—Observe the polar distance of a star which is six hours from the meridian, the star being not very near the pole, nor yet near the horizon. Correct this for refraction in polar distance, and compare the result with the true polar distance from the *Nautical Almanac*. If the star is to the east of the meridian, and the instrumental exceeds the apparent polar distance, the north pole of the instrument is to the west of the celestial pole.

“Example.”—The polar distance of α Ursæ Majoris, when six hours west from the meridian, was observed to be $27^{\circ} 23' 49''\cdot0$, the face of the circle being west. Correcting this for index error found above, $16''\cdot5$, and for refraction $30''\cdot8$, the result is $27^{\circ} 24' 36''\cdot3$. The polar distance by the *Nautical Almanac* is $27^{\circ} 24' 43''\cdot7$. Hence the pole of the instrument was $7''\cdot4$ west.

“Fourth Adjustment.”—Observe the transit of an equatorial star over the middle vertical wire, or mean of the wires; note the time, and read off the verniers of the hour-circle. Turn the polar axis half round, and observe the same star a second time exactly as before. Now the interval between the two observations should correspond exactly to the difference between the two readings of the hour-circle. If they do not correspond, it is evident that one of the transits has been observed too early, and the other too late, on account of the erroneous position of the wires. One half the difference between the interval as measured by the clock, and that by the hour-circle, will be the error of collimation.

“Example.”—The following observations were made upon δ Ophiuchi:—

Face of Circle.	Sidereal Time.	Hour-Circle.
	h. m. s.	h. m. s.
West	16 12 58·8	0 6 51·0
East	16 19 9·7	0 13 0·5

“The interval between the two observations is 6m. 10·9s.; the difference between the two readings of the hour-circle is 6m. 9·5s. One-half the difference is 0·7s., which is the error of sight or of collimation, to be added to the readings of the hour-circle when the circle is east.

“Fifth Adjustment.”—The declination axis should be placed by the maker

perpendicular to the polar axis, and, having been once accurately adjusted, is not liable to subsequent derangement. The accuracy of this adjustment may be tested as follows: Bring the declination axis into a horizontal position by means of a spirit-level, whose legs rest upon the extremities of the declination axis, and read the hour-circle. Turn the polar axis half round; bring the declination axis into a horizontal position by means of the level, as before, and again read the hour-circle. If the readings agree in both positions, or differ by 12h. (when the graduation is to 24h.), the declination axis is adjusted. If the readings do not agree, the declination axis is not perpendicular to the polar axis. If the declination axis is furnished with adjusting screws, place the hour-circle half-way between the position it actually has and that which it ought to occupy, in order that the readings may differ by exactly twelve hours, and make the declination axis horizontal by raising or depressing the proper screws.

"This adjustment may be tested astronomically as follows: Observe the transit of a star not less than 45° from the equator, in both positions of the polar axis, as directed for the fourth adjustment. Since an elevation of the west end of the declination axis causes the line of sight to describe a circle to the east of the pole, all the transits observed in that position will be too early; and, *vice-versâ*, all will be too late when the east end is high. Again, if the west end is too high before reversing, the east end is too high after reversing, so that an error of inclination has a different effect upon observations in reversed positions, and thus the interval is increased or diminished by twice the error of a single observation.

"*Sixth Adjustment.*—Set the declination axis horizontal by means of the level, when, if the previous adjustments have been properly performed, the instrument will be in the meridian, and the verniers may be set to zero.

"If it is proposed to determine the absolute place of a heavenly body by means of the equatorial, it is necessary to determine its errors with great accuracy; but this instrument is chiefly employed for determining *differences* of right ascension and declination of objects very near each other, in which case entire accuracy in all the adjustments becomes of less importance." — *Loomis's Practical Astronomy*.

The use of the equatorial, or the method of finding any object in the heavens, the right ascension and declination of which are known to the observer, may now be described. "In some equatorials of the highest class the hour-circle is not permanently fixed to the polar axis, but turns freely upon the lower pivot, and may be kept in motion by the clock at the rate of one revolution in twenty-four sidereal hours: the hours increase in the order of right ascension, and they are pointed to by an index fixed to the pier.

"A second index is fixed to the polar axis, and is furnished with a clamp, by which it can be firmly attached to any part of the hour-circle, and

when so fixed, be carried round by the clockwork. The positions of the indices (or verniers) are so arranged that they point to the same division upon the hour-circle when the telescope is in the meridian, and if they then indicate the sidereal time, or right ascension of the meridian, it will be evident that the second index will, when the telescope is in another position, indicate the right ascension of that point of the heavens to which the line of sight is directed. This improvement was first introduced by the present Astronomer Royal, and first applied to the Northumberland equatorial at the Cambridge Observatory."

—*Simms*.

Let it be required to find Arcturus in the daylight, the right ascension and declination of this star are (see Catalogue—Constellation of Bootes) R. A. 14h. 9m. 32s., N. D. $19^{\circ} 53' 49''$. Set the declination-circle to the position $19^{\circ} 53\frac{1}{2}'$ (if the circle is divided into degrees and half-degrees, the vernier will probably read *minutes*: the size of the circle generally determines the number of the divisions). Turn the telescope until the index or arrow-point of the vernier shows $19^{\circ} 30'$ north, and so far beyond that the coincidence between the divisions of the circle and the vernier takes place at the 24th division of the latter; this will give $19^{\circ} 54'$ (the $49''$ previously disregarded with $37''$ added for refraction making the difference of rather more than one minute). For objects having south declination, the vernier must be read the reverse way.

Having clamped the telescope at this position of declination, the instrument must now be set for the right ascension of the star. If the hour-circle be movable, the mode of proceeding is as follows:—The circle is divided into hours, subdivided into minutes, and the verniers read to four seconds; whatever the subdivisions are, the principle is the same. Turn the hour-circle so that it reads 14h. 9m. 32s. by the vernier attached to the polar axis, and clamp it; now turn the telescope again until the circle shows by the second vernier, which is fixed to the pier, the sidereal time by the clock; then the object sought for will be in the field.

If the hour-circle is attached to the polar axis, the mode of proceeding will be different. The R. A. of the star being known, it will be seen by the sidereal clock whether the object is *past* the meridian or not. The R. A. of the object named above being 14h. 9m. 32s., if the clock shows 10h. 12m. 5s., it will be 3h. 57m. 27s. before the star is on the meridian. Therefore, supposing the circle and vernier to be placed for the meridian passage, it will be necessary to turn the telescope back, or towards the east, until the vernier indicates the difference; viz., 3h. 57m. 27s. Should the star have passed the meridian, the telescope must be turned so as to show the difference, whatever it may be, in the opposite direction.

If the hour-circle be *fixed* and the vernier attached to the polar axis and moving with the telescope, the same directions must be observed.

When the hour-circle has only one vernier, it is necessary to make a short

calculation in every case before the position of the object can be found. This occasions a loss of time, and is often inconvenient; a movable hour-circle with two verniers is much to be preferred.

The registration of the position of an object may be made approximately in the following manner:—Place the object in the centre of the field, read off the declination and register it. Turn the hour-circle (if movable) and clamp it to the time shown by the sidereal clock; now turn the telescope until the object is again in the centre of the field, and the vernier fixed to the axis of the telescope will show the R. A. of the object, care being taken to notice that the time of the observation is the same as that indicated by the hour-circle and clock. If the object be a fixed star, the registration in this manner will be sufficient to find it again at any future time. In the case of a comet, the same directions apply; but as the position is constantly changing, several observations are necessary in order to determine the direction in which the object is moving; perfect accuracy can only be attained by means of micrometrical measurement, and reference to stars in the immediate neighbourhood of the object.

The equatorial telescope may be used also as a *transit instrument* for obtaining sidereal time. Any star in the following Catalogue may be used for the purpose, the meridian passage being the most favourable time; but it will be found convenient for this and other purposes to have the *Nautical Almanac* always at hand. Set the circles for the position of the star, and observe whether it arrives at the centre of the field at the true time. If the star be not visible, turn the telescope east or west until it appears. Let care be taken in setting the declination-circle, and observe by the vernier the difference whether east or west. If the telescope has been turned towards the east, the clock is too fast; if to the west, it must be too slow. Alter the clock to the observed time, and all other objects required on the same night may readily be found, if the telescope be of sufficient power to show them. A clock of some kind is indispensable to the efficiency of the equatorial; but in the absence of a good sidereal clock, any common clock or watch, as suggested by Admiral Smyth in his “Cycle of Celestial Objects,” may be so regulated as to answer the purpose, as a “*journeyman*,” by adjusting it so as to gain nearly four minutes daily on mean time. A clock of some kind beating seconds or half-seconds is to be preferred to a watch, as it is advantageous to *hear* the beating of the seconds.

The *Nautical Almanac* contains full directions for converting mean time into sidereal time, and *vice-versâ*. It may be useful to give an example in each case:—

Example I.—To convert 14h. 45m. sidereal time at Manchester to Greenwich mean time, on 13th July, 1864.

Refer to the *Nautical Almanac*, and at page xx. of any required month, the mean time of the transit of the first point of Aries will be found.

	H.	M.	S.
Mean time at <i>preceding</i> sidereal noon (July 12), p. xx. ...	16	34	44.60
Add given sidereal time (14h. 45m.) reduced to mean time (see Table <i>Nautical Almanac</i> , p. 502)	14	42	34.90
Add 8m. 52s. (the difference of time between Greenwich and Manchester)		8	52

 31 26 11.50

Less... .. 24 0 0

 Gives Greenwich mean time ... 7 26 11.50

Example II.—To convert 8h. 47m. Greenwich mean time to sidereal time at Manchester, 13th July, 1864.

Sidereal time at mean noon (see <i>Nautical Almanac</i> , p. ii., July 13, 1864)	7	26	28.55
Add mean time converted to sidereal time (<i>Nautical Almanac</i> , p. 500)	8	48	26.57

 16 14 55.12

Subtract* 8 52

 Gives the required sidereal time ... 16 6 3.12

The Table of Refractions will be found useful in finding the positions of objects. The difference caused by atmospheric refraction is very large near the horizon, and gradually lessens towards the zenith, where it ceases altogether. In using the Table, it must be observed that the degrees are numbered from the horizon upwards; therefore to an observer in latitude 53° north, a star or other object having a north declination of 20° will require the addition of $37''$, as the distance above the horizon is 57° . An object situated 12° south of the equator requires the addition of $2'$, as it is 25° above the horizon. The latitude of the observer must always be taken into account in the corrections for refraction.

“A CATALOGUE of stars may be considered in two very distinct lights,—either as a mere list of objects placed on record to fix on them the attention of astronomers, and to afford them matter for observation, or as a collection of well-determined zero-points, offering ready means of comparing their observations with those of others, and of detecting and allowing for instrumental errors. In this light only I shall now consider the Catalogue as of importance, chiefly

* The subtraction or addition of the difference between Greenwich mean time and local time depends on the place of observation being situated east or west of the meridian of Greenwich.

to the practical astronomer. It is for his uses that an amount of pains, labour, and expense, both national and individual, has been bestowed on the perfection of such catalogues, which on a superficial view must appear in the last degree lavish, but which yet has been no more than the necessity of the case demands. If we ask to what end magnificent establishments are maintained by states and sovereigns, furnished with masterpieces of art, and placed under the direction of men of first-rate talent and high-minded enthusiasm, sought out for those qualities amongst the foremost in the ranks of science—if we demand *cui bono*—for what good—a BRADLEY has toiled, or a MASKELYNE or a PIAZZI worn out his venerable age in watching, the answer is—not to settle mere speculative points in the doctrines of the universe; not to cater for the pride of man, by refined inquiries into the remote mysteries of nature; not to trace the path of our system through infinite space, or its history through past and future eternities. These, indeed, are noble ends, and which I am far from any thought of depreciating; the mind swells in their contemplation, and attains in their pursuit an expansion and a hardihood which fit it for the boldest enterprise; but the direct practical utility of such labours is fully worthy of their speculative grandeur. The stars are the landmarks of the universe; and, amidst the endless and complicated fluctuations of our system, seem placed by the Creator as guides and records, not merely to elevate our minds by the contemplation of what is vast, but to teach us to direct our actions by reference to what is immutable in His works. It is, indeed, hardly possible to over-appreciate their value in this point of view. Every well-determined star, from the moment its place is registered, becomes to the astronomer, the geographer, the navigator, the surveyor, a point of departure which can never deceive or fail him,—the same for ever and in all places,—of a delicacy so extreme as to be a test for every instrument invented by man, yet equally adapted for the most ordinary purposes; as available for regulating a town-clock, as for conducting a navy to the Indies; as effective for mapping down the intricacies of a petty barony, as for adjusting the boundaries of transatlantic empires. When once its place has been thoroughly ascertained and carefully recorded, the brazen circle, with which that useful work was done, may moulder, the marble pillar totter on its base, and the astronomer himself survive only in the gratitude of his posterity; but the record remains, and transfuses all its own exactness into every determination which takes it for a groundwork, giving to inferior instruments, nay, even to temporary contrivances, and to the observations of a few weeks or days, all the precision attained originally at the cost of so much time, labour, and expense.”—*Sir John Herschel on the Catalogue of the Royal Astronomical Society.*

DOUBLE STARS.

TEST-OBJECTS.

Nearly equal Stars.

(From Smyth's "Cycle of Celestial Objects.")

Designation.	Place, A. D. 1865.						Magnitudes of Stars.	Distance in Seconds.
	Right Ascension.			Declination.				
	h.	m.	s.	°	'	"		
γ Delphini	20	40	26	N. 15	38	33	a 4, b 5½	12.0
γ Arietis	1	46	6	N. 18	38	0	a 4½, b 5	8.8
μ Cygni	21	38	4	N. 28	8	10	a 5, b 6	5.5
α Geminorum	7	25	29	N. 32	17	0	a 3, b 3½	4.9
38 Piscium	0	10	26	N. 8	7	33	a 7½, b 8	4.8
44 Bootis	14	59	21	N. 48	10	51	a 5, b 6	3.7
α Piscium	1	55	3	N. 2	6	39	a 5, b 6	3.7
ρ Herculis	17	19	2	N. 37	16	23	a 4, b 5½	3.6
ζ Aquarii	22	22	10	S. 0	42	37	a 4, b 4½	3.5
μ Draconis	17	2	33	N. 54	39	7	a 4, b 4½	3.3
ϵ Lyræ	18	39	51	N. 39	31	43	a 5, b 6½	3.2
γ Leonis	10	12	30	N. 20	31	35	a 2, b 4	2.8
11 Monocerotis	6	22	16	S. 6	56	52	a 7, b 8	2.7
δ Lyræ	18	39	51	N. 39	41	43	a 5, b 5½	2.6
ξ Ursæ Majoris	11	10	59	N. 32	17	39	a 4, b 5½	2.3
γ Virginis (dist. 1844). .	12	34	50	S. 0	42	34	a 4, b 4	1.9
σ Coronæ Borealis	16	9	37	N. 34	12	12	a 6, b 6½	1.8
π Aquilæ	19	42	20	N. 11	28	58	a 6, b 7	1.7
ζ Bootis	14	45	9	N. 19	39	48	a 4, b 4½	1.3
ζ Cancræ	8	4	23	N. 18	3	14	a 6, b 7	1.2
36 Andromedæ	0	47	43	N. 22	55	53	a 6, b 7	1.0
ϵ Arietis	2	51	29	N. 20	47	57	a 5, b 6½	0.9
μ^2 Bootis	15	19	25	N. 37	49	18	a 8, b 8½	0.8
20 Draconis	16	55	45	N. 65	14	41	a 7, b 7½	0.7
ϵ Equulei	21	52	20	N. 3	46	46	a 5½, b 7½	0.5
η Coronæ Borealis	15	17	37	N. 30	46	44	a 6, b 6½	0.5
γ^2 Andromedæ	1	55	37	N. 41	40	56	a 5½, b 6	0.4

DOUBLE STARS.

TEST-OBJECTS.

Unequal Stars.

Designation.	Place, A.D. 1865.			Magnitudes of Stars.	Distance in Seconds.	
	Right Ascension.		Declination.			
	h.	m.	s.			
β Cygni	19	25	17	N. 27 40 42	a 3, b 7	34.4
ζ Ursæ Majoris. . . .	13	18	28	N. 55 37 45	a 3, b 5	14.4
35 Piscium.	0	8	1	N. 8 4 15	a 6, b 8	11.9
γ Andromedæ	1	55	37	N. 41 40 56	a 3½, b 5½	10.0
ξ Bootis	14	45	9	N. 19 39 48	a 3½, b 6½	6.9
ξ Cephei	21	59	52	N. 63 58 13	a 5, b 7	5.8
α Herculis	17	8	29	N. 14 32 36	a 3½, b 5½	4.5
ϵ Hydræ	8	39	38	N. 6 54 53	a 4, b 8½	3.6
ι Trianguli	2	4	32	N. 29 40 10	a 5½, b 7	3.5
ϵ Bootis	14	39	5	N. 27 38 40	a 3, b 7	3.3
ϵ Draconis	19	48	45	N. 69 55 25	a 5½, b 9½	3.1
σ Cassiopeæ	23	52	10	N. 54 52 47	a 6, b 8	3.0
δ Serpentis	15	28	21	N. 10 59 32	a 3, b 5	2.8
γ Ceti	2	36	19	N. 2 40 1	a 3, b 7	2.6
ζ Orionis	5	33	56	S. 2 1 1	a 3, b 6½	2.5
ι Leonis	11	16	53	N. 11 16 36	a 4, b 7½	2.5
35 Cassiopeæ	2	17	58	N. 66 47 37	a 4½, b 7	2.1
ζ Herculis	16	36	12	N. 31 50 41	a 3, b 6	1.2
λ Ophiuchi	16	24	6	N. 2 16 53	a 4, b 6	1.1
32 Orionis	5	23	33	N. 5 40 40	a 5, b 7	1.0
4 Aquarii	20	44	16	S. 6 7 45	a 6, b 8	0.5
γ Cor. Borealis	15	37	4	N. 26 43 30	a 5, b 7	0.2

DOUBLE STARS.

TEST-OBJECTS.

Very unequal.

Designation.	Epoch, A. D. 1865.						Magnitudes of Stars.	Distance in Seconds.
	Right Ascension.			Declination.				
	h.	m.	s.	°	'	"		
α Lyræ	18	32	20	N. 38	39	15	a 1, b 11	43.4
42 Piscium	0	15	26	N. 12	43	56	a 7, b 13	35.0
δ Equulei	21	7	55	N. 9	27	46	a 4 $\frac{1}{2}$, b 11	28.2
7 Camelopardi	4	46	27	N. 53	32	0	a 5, b 13	27.0
Polaris	1	8	54	N. 88	35	26	a 2 $\frac{1}{2}$, b 9 $\frac{1}{2}$	18.6
41 Arietis :	2	42	1	N. 26	42	17	a 3, b 13	15.0
θ Persei	2	34	48	N. 48	39	27	a 4, b 13	15.0
λ Geminorum	7	10	20	N. 16	47	3	a 4 $\frac{1}{2}$, b 12	10.3
η Cassiopeæ	0	40	52	N. 57	6	2	a 4, b 7 $\frac{1}{2}$	9.7
β Orionis	5	8	3	S. 8	21	35	a 1, b 9	9.5
ϕ Piscium.	1	6	25	N. 23	52	7	a 6, b 13	9.0
δ Geminorum	7	12	4	N. 22	13	47	a 3 $\frac{1}{2}$, b 9	7.1
34 Piscium.	0	3	10	N. 10	22	57	a 6, b 13 $\frac{1}{2}$	7.0
ν Ceti	2	28	47	N. 5	0	11	a 4 $\frac{1}{2}$, b 15	6.0
κ Geminorum	7	36	20	N. 24	43	9	a 4, b 10	6.0
84 Ceti	2	34	11	S. 1	16	9	a 6, b 14	5.0
17 Lyræ	19	2	19	N. 35	17	24	a 6, b 11	3.6
11 Cancri	8	0	34	N. 27	51	56	a 7, b 12	3.2
γ Crateris.	11	18	9	S. 16	56	30	a 4, b 14	3.0
δ Cygni	19	40	45	N. 44	48	8	a 3 $\frac{1}{2}$, b 9	1.8

NEBULÆ AND CLUSTERS.

TEST-OBJECTS.

Objects.	Place, A.D. 1865.						Remarks.
	Right Ascen.			Declination.			
	h.	m.	s.	N.	°	"	
33 \mathbb{H} VI. Persei .	2	9	41	N. 56	31	29	A glorious double cluster.
31 M Andromedæ .	0	35	26	N. 40	31	50	"The Queen of the nebulae."
13 M Herculis . .	16	36	51	N. 36	42	48	Glorious cluster.
42 M Orionis . .	5	28	38	S. 5	28	49	The great nebula.
5 M Libræ . . .	15	11	41	N. 2	35	40	A splendid cluster.
51 M Canum Venat.	13	24	9	N. 47	53	54	Great double spiral.
3 M Canum Venat.	13	35	54	N. 29	2	58	Globular cluster.
27 M Vulpeculæ .	19	53	44	N. 22	21	2	The Dumbell nebula.
15 M Pegasi . . .	21	23	25	N. 11	33	51	A globular cluster.
17 M Clyp. Sobieski	18	12	49	S. 16	15	23	Horseshoe nebula.
2 M Aquarii . . .	21	26	27	S. 1	25	35	A ball of stars.
28 M Sagittarii . .	18	16	13	S. 24	56	22	Globular cluster.
60 M Virginis . .	12	36	48	N. 12	17	51	Double nebula.
53 M Comæ Beren.	13	6	17	N. 18	53	17	Globular cluster.
10 M Ophiuchi . .	16	50	4	S. 3	54	21	Rich round mass.
103 \mathbb{H} I. Delphini .	20	27	34	N. 6	58	9	Mass of minute stars.
70 \mathbb{H} I. Virginis .	14	22	31	S. 5	21	55	Resolvable into stars.
27 \mathbb{H} IV. Hydræ .	10	18	18	S. 17	58	7	Fine planetary nebula.
57 M Lyræ . . .	18	48	32	N. 32	51	49	A ring nebula. †
64 M Comæ Beren.	12	50	6	N. 22	25	2	A long bright nebula.
19 \mathbb{H} V. Androm..	2	14	10	N. 41	43	5	Flat ring nebula.

The letters of the Greek alphabet are as follow :—

A α	a	alpha	I ι	i	iōta	P ρ	r	ro
B β €	b	bēta	K κ	k	kappa	Σ σ ξ	s	sigma
Γ γ	g	gamma	Λ λ	l	lambda	T τ ρ	t	tau
Δ δ	d	delta	M μ	m	mu	Υ υ	u	upsilon
E ε	ē	ēpsilon	N ν	n	nu	Φ φ	ph	phi
Z ζ	z	zēta	Ξ ξ	x	xi	X χ	ch	chi
H η	ē	hēta	O o	ō	ōmicron	Ψ ψ	ps	psi
Θ θ ϑ	th	thēta	Π π	p	pi	Ω ω	ō	ōmēga

TABLE OF REFRACTIONS

(BESSEL).

App. Alt.	Mean Refract.	Differ. for 10'.	App. Alt.	Mean Refract.	Differ. for 10'.	App. Alt.	Mean Refract.	Differ. for 10'.
0 0	34 54.1	"	9 0	5 49.3	"	33 0	1 28.7	"
10 0	32 49.2	124.9	10 0	5 43.3	6.0	34 0	1 25.4	3.3
20 0	30 52.3	116.9	20 0	5 37.6	5.7	35 0	1 22.3	3.1
30 0	29 3.5	108.8	30 0	5 32.0	5.6	36 0	1 19.3	3.0
40 0	27 22.7	100.8	40 0	5 26.5	5.5	37 0	1 16.5	2.8
50 0	25 49.8	92.9	50 0	5 21.3	5.2	38 0	1 13.8	2.7
1 0	24 24.6	85.2			5.1	39 0	1 11.2	2.6
10 0	23 6.7	77.9	10 0	5 16.2	5.0	40 0	1 8.7	2.5
20 0	21 55.6	71.1	10 0	5 11.2	4.8	41 0	1 6.3	2.4
30 0	20 50.9	64.7	20 0	5 6.4	4.7	42 0	1 4.0	2.3
40 0	19 51.9	59.0	30 0	5 1.7	4.7	43 0	1 1.8	2.2
50 0	18 58.0	53.9	40 0	4 57.2	4.5	44 0	0 59.7	2.1
		49.4	50 0	4 52.8	4.4			2.0
2 0	18 8.6	45.6	11 0	4 48.5	4.3	45 0	57.7	2.0
10 0	17 23.0	42.3	10 0	4 44.3	4.2	46 0	55.7	1.9
20 0	16 40.7	39.8	20 0	4 40.2	4.1	47 0	53.8	1.9
30 0	16 0.9	37.5	30 0	4 36.3	3.9	48 0	51.9	1.7
40 0	15 23.4	35.6	40 0	4 32.4	3.9	49 0	50.2	1.8
50 0	14 47.8	33.2	50 0	4 28.7	3.7	50 0	48.4	1.7
3 0	14 14.6	30.9			3.7	51 0	46.7	1.6
10 0	13 43.7	28.7	12 0	4 25.0	3.6	52 0	45.1	1.6
20 0	13 15.0	26.7	10 0	4 21.4	3.4	53 0	43.5	1.6
30 0	12 48.3	24.6	20 0	4 18.0	3.4	54 0	41.9	1.5
40 0	12 23.7	23.0	30 0	4 14.6	3.3	55 0	40.4	1.5
50 0	12 0.7	21.8	40 0	4 11.3	3.3	56 0	38.9	1.4
		20.6	50 0	4 8.0	3.1			1.4
4 0	11 38.9	19.7	13 0	4 4.9	3.1	57 0	37.5	1.4
10 0	11 18.3	19.0	10 0	4 1.8	3.0	58 0	36.1	1.4
20 0	10 58.6	18.4	20 0	3 58.8	2.9	59 0	34.7	1.4
30 0	10 39.6	17.9	30 0	3 55.9	2.9	60 0	33.3	1.3
40 0	10 21.2	16.8	40 0	3 53.0	2.8	61 0	32.0	1.3
50 0	10 3.3	15.6	50 0	3 50.2	2.8	62 0	30.7	1.3
5 0	9 46.5	14.9			2.7	63 0	29.4	1.3
10 0	9 30.9	14.1	14 0	3 47.4	2.7	64 0	28.2	1.3
20 0	9 16.0	13.5	10 0	3 44.7	2.6	65 0	26.9	1.2
30 0	9 1.9	12.8	20 0	3 42.1	2.6	66 0	25.7	1.2
40 0	8 48.4	12.3	30 0	3 39.5	2.5	67 0	24.5	1.2
50 0	8 35.6	11.7	40 0	3 37.0	2.5	68 0	23.3	1.1
		11.3	50 0	3 34.5	2.4			1.1
6 0	8 23.3	10.8	15 0	3 32.1	2.4	69 0	22.2	1.1
10 0	8 11.6	10.3	16 0	3 29.6	2.3	70 0	21.0	1.1
20 0	8 0.3	10.0	17 0	3 27.1	2.2	71 0	19.9	1.1
30 0	7 49.5	9.5	18 0	3 24.6	2.1	72 0	18.8	1.1
40 0	7 39.2	9.2	19 0	3 22.1	2.0	73 0	17.7	1.1
50 0	7 29.2	8.8	20 0	3 19.6	1.9	74 0	16.6	1.1
7 0	7 19.7	8.4			1.8	75 0	15.5	1.1
10 0	7 10.5	8.2	21 0	3 17.1	1.7	76 0	14.4	1.1
20 0	7 1.7	7.9	22 0	3 14.6	1.6	77 0	13.3	1.1
30 0	6 53.3	7.6	23 0	3 12.1	1.5	78 0	12.2	1.1
40 0	6 45.1	7.3	24 0	3 9.6	1.4	79 0	11.1	1.1
50 0	6 37.2	7.1	25 0	3 7.1	1.3	80 0	10.0	1.1
		6.8	26 0	3 4.6	1.2	81 0	8.9	1.1
8 0	6 29.6	6.6	27 0	3 2.1	1.1	82 0	7.8	1.1
10 0	6 22.3	6.4	28 0	3 0.0	1.0	83 0	6.7	1.1
20 0	6 15.2	6.1	29 0	2 57.5	0.9	84 0	5.6	1.1
30 0	6 8.4	5.9	30 0	2 55.0	0.8	85 0	4.5	1.1
40 0	6 1.8	5.7	31 0	2 52.5	0.7	86 0	3.4	1.1
50 0	5 55.4	5.5	32 0	2 50.0	0.6	87 0	2.3	1.1
		5.3			0.5	88 0	1.2	1.1
		5.1			0.4	89 0	0.1	1.1
		4.9			0.3	90 0	0.0	1.1

POSITIONS OF THE PRINCIPAL CONSTELLATIONS AND STARS,

On the 1st of each Month, in Lat. 50° N. at 9h. P.M.

Month.	East of Meridian.	Near		West of Meridian.	Towards the Pole.
		Meridian.	Zenith.		
Jan.	Capella, Orion, Sirius, Procyon, Gemini, Regulus (rising).	Pleiades, Aldebaran.	Perseus.	Cetus, Aries, Andromeda, Pegasus.	To the right—Great Bear. Below—Little Bear, Dragon. To the left—Cassio- pea, Cygnus.
Feb.	Sirius, Procyon, Gemini, Leo, α Hydræ.	Sirius, Orion, the Dove.	Auriga.	Taurus, Pleiades, Aries, Cetus, Perseus, Andromeda, Pegasus.	
March.	α Hydræ, Leo, Arcturus, Spica (rising).	Procyon, Argo.	Gemini.	Sirius, Orion, Capella, Aldebaran, Aries.	To the right—the two Bears, Dragon. Below—Cygnus. To the left—Cassio- pea, Perseus, An- dromeda.
April.	Spica, Arcturus, Northern Crown, Cor Caroli, β Leonis.	Hydra, Leo.		Procyon, Gemini, Orion, Aldebaran, Capella, Sirius.	
May.	Spica, Libra, Arcturus, Crown, α Serpentis, Ophiuchus.	β Leonis.	Great Bear.	Hydra, Leo, Procyon, Gemini, Capella in Auriga.	To the right—Dra- gon, Little Bear α Cygni, Lyra. Below—Cassiopea. To the left—Perseus.
June.	Libra, Antares, Serpens, Ophiuchus, Hercules, Crown, Lyra, Eagle (rising).	Spica, Arcturus.	η Urs. Maj.	Virgo, Leo, Hydra, Gemini.	
July.	Ophiuchus, Hercules, Eagle, the Swan, Lyra, Pegasus (rising).	Antares, α Serpentis, Crown.	Dragon.	Libra, Virgo, Arcturus, Leo.	Above—Dragon, Lit- tle Bear. To the right—Cassio- pea. Below—Perseus, Au- riga. To the left—Gt. Bear.
Aug.	Eagle, Swan, Pegasus.	Ophiuchus, Hercules.	Lyra, γ Draconis.	Scorpion, Libra, Serpens, Crown, Arcturus in Bootes.	
Sept.	Pegasus, Andromeda, Aries.	Eagle.	Swan, Lyra.	Arcturus, Serpens, Ophiuchus, Hercules, Crown.	To the right—Cassio- pea. To the left—the Bears.
Oct.	Aries, Cetus, Pegasus, Andromeda, Perseus, Fomalhaut.			Eagle, Hercules, Lyra, Crown.	
Nov.	Andromeda, Aries, Taurus, Whale, Orion (rising).	Pegasus, Fomalhaut.		Eagle, Swan, Lyra.	To the right—Cassio- pea, Auriga. Below—Great Bear. To the left—Little Bear, Dragon.
Dec.	Eridanus, Taurus, Whale, Orion, Twins, Perseus.	Whale.	Andromeda	Pegasus, Andro- meda, Swan, Lyra.	
					Above—Cassiopea. To the right—Great Bear. To the left—Dragon.

H. W. JEAN, F.R.A.S.

Approximate Mean Times when the principal Stars bear due East or West of a Spectator in Latitude 50° N., on the first of each Month.

Star	January.			February.			March.			April.			May.			June.			July.			August.			September.			October.			November.			December.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m	E.	h	m

A CATALOGUE OF VARIABLE STARS.

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The symbol \angle signifies that the star's minimum magnitude fell below that given.

No.	Star.	R. A. 1870.			Decl. 1870.	Period.	Change of Magnitude.		Discoverer.
		h.	m.	s.			From	to	
1	R Andromedæ . . .	0	17	10	+ 47 51.0	..	6		Argelander . 1860
2	T Piscium . . .	0	25	17	+ 13 49.3	143±	9.5	11	R. Luther . 1855
3	α Cassiopeïæ . . .	0	33	9	+ 55 49.4	79.1	2	2.5	Birt . . . 1831
4	U Piscium . . .	0	37	34	+ 6 35.1	..	9	12	Hind . . .
5	S Cassiopeïæ . . .	1	10	9	+ 71 54.2	..		13 \angle	Argelander .
6	S Piscium . . .	1	10	46	+ 8 14.2	13m±	6	13	Hind . . . 1851
7	R Piscium . . .	1	23	56	+ 2 12.1	343	7	9.5	Hind . . . 1850
8	V Piscium . . .	1	47	29	+ 8 45.5	..	6	9	Argelander . 1863
9	R Arietis . . .	2	8	42	+ 24 26.8	186	8	12 \angle	Argelander . 1855
10	α Ceti . . .	2	12	19	- 3 33.9	331.336	2	12 \angle	D. Fabricius 1596
11	ρ Persei . . .	2	56	50	+ 38 20.1	33	4		Schmidt . .
12	β Persei . . .	2	59	41	+ 40 27.2	2.86727	2.5	4	Montanari . 1669
13	R Persei . . .	3	21	47	+ 35 13.2	..	9	13 \angle	Winnecke .
14	λ Tauri . . .	3	53	35	+ 12 7.3	3.952	4	4.5	Baxendell . 1848
15	U Tauri . . .	4	14	15	+ 19 30.5	..	9	10.4	Baxendell . 1862
16	T Tauri . . .	4	14	25	+ 19 13.5	..	9.7	13.5 \angle	Hind . . .
17	R Tauri . . .	4	21	11	+ 9 52.4	327	8	13.5 \angle	Hind . . . 1849
18	S Tauri . . .	4	22	5	+ 9 39.4	375	10	13 \angle	Oudemans .
19	R Orionis . . .	4	48	7	+ 7 56.0	378	9	12.5 \angle	Hind . . . 1848
20	ϵ Aurigæ . . .	4	52	38	+ 43 37.7	350±	3.5	4.5	Heis . . . 1846
21	R Leporis . . .	4	53	14	- 15 1.0	..	7		Schmidt . . 1855
22	R Aurigæ . . .	5	6	48	+ 53 26.2	..			Argelander .
23	α Orionis . . .	5	48	8	+ 7 22.8	196±	1	1.5	J. Herschel. 1836
24	α Argûs . . .	6	21	4	- 52 37.5	..			
25	R Monocerotis . .	6	32	4	+ 8 52.5	..	10	13	Schmidt . .
26	ζ Geminorum . .	6	56	24	+ 20 45.0	10.16	3.8	4.5	Schmidt . . 1847
27	R Geminorum . .	6	59	32	+ 22 54.2	370	7.3	11	Hind . . . 1848
28	R Canis Minoris .	7	1	32	+ 10 13.2	367±	8	10	Argelander . 1854
29	S Canis Minoris .	7	25	39	+ 8 35.8	335	8.5	11 \angle	Hind . . . 1856
30	S Geminorum . .	7	35	14	+ 23 45.7	294.07	9.2	13.5 \angle	Hind . . . 1848
31	T Geminorum . .	7	41	29	+ 24 3.6	288.64	9.5	13.5	Hind . . . 1848
32	U Geminorum . .	7	47	23	+ 22 20.6	97	9	13.5 \angle	Hind . . . 1848
33	R Cancri . . .	8	9	29	+ 12 5.2	357	6	10 \angle	Schwerd . . 1829
34	U Cancri . . .	8	28	19	+ 19 21.0	306	9	13.5 \angle	Chacornac .
35	S Cancri . . .	8	36	11	+ 19 30.1	9.48	8	10.5	Hind . . . 1848
36	S Hydræ . . .	8	46	47	+ 3 33.8	256	8.5	13.5	Hind . . . 1848
37	T Hydræ . . .	8	49	20	- 8 39.2	292 or 326±	6.5	10.5	Hind . . . 1851
38	T Cancri . . .	8	49	25	+ 20 20.8	455±	9.5	12	Hind . . . 1850
39	α Hydræ . . .	9	21	11	- 8 5.6	55	2.5	3	J. Herschel. 1837
40	R Leonis . . .	9	40	34	+ 12 1.9	312.57	5	11.5	Koch . . . 1782
41	R Ursæ Majoris .	10	35	25	+ 69 27.5	301.90	7	13	Pogson . . 1853
42	η Argûs . . .	10	40	1	- 58 59.1	46 years	1	4	Burchell . . 1827
43	α Ursæ Majoris .	10	55	42	+ 62 27.1	sme. yrs.	15	2	Lalande . . 1786
44	S Leonis . . .	11	4	7	+ 9 9.8	192	9	13 \angle	Chacornac .

No.	Star	R. A. 1870.			Decl. 1870.		Period.	Change of Magnitude.			Discoverer.
		h.	m.	s.	°	'		From	to	∠	
45	R Comæ Berenicis	11	57	34	+ 19	30·7	Days. 1 yr. ±	8	13	∠	Schönfeld . 1856
46	T Virginis . .	12	7	56	— 5	18·3	337	8	13	∠	Boguslawski
47	21 Virginis . .	12	27	4	— 8	44·1	..	5·5			
48	T Ursæ Majoris .	12	30	29	+ 60	12·7	257	6·7	13	∠	Argelander .
49	R Virginis . .	12	31	54	+ 7	42·7	146	6·5	11	∠	Harding . . 1809
50	S Ursæ Majoris .	12	38	14	+ 61	48·3	222·6	7·5	12		Pogson . . 1853
51	U Virginis . .	12	44	30	+ 6	15·7	212	7·5	12	∠	Harding . .
52	V Virginis . .	13	21	7	— 2	31·1	252	7			Goldschmidt 1857
53	R (v) Hydræ . .	13	22	36	— 22	47·4	449·5	4	10	∠	J. P. Maraldi 1704
54	W Virginis . .	13	23	39	— 8	56·1	..	8·5			Hind . . .
55	S Virginis . .	13	26	13	— 6	31·1	380·11	6	11		Hind . . . 1852
56	η Ursæ Majoris .	13	42	24	+ 49	57·8	same. yrs.	1·5	2		Lalande . . 1786
57	X Virginis . .	13	47	39	+ 11	48·0	..	8·5			Hind . . .
58	T Boötis . .	14	7	59	+ 19	40·2	..	9·7	14	∠	Baxendell . 1860
59	S Boötis . .	14	18	21	+ 54	25·3	..	8	12		Argelander . 1860
60	R Camelopardi .	14	28	26	+ 84	25·3	265	7	13		Winnecke .
61	R Boötis . .	14	31	27	+ 27	18·4	196	8	12		Argelander .
62	U Boötis . .	14	34	48	+ 28	1·4	..	9·5	13		Baxendell . 1864
63	S Libræ . .	14	45	11	— 11	47·5	..	8	9·5		Schumacher.
64	T Libræ . .	14	49	33	— 3	49·5	..	8·5	10		Hind . . .
65	β Ursæ Minoris .	14	51	5	+ 74	41·5	2 or 3 y.	2	2·5		W. Struve . 1838
66	S Serpentis . .	15	15	35	+ 14	46·8	359	8	10	∠	Harding . . 1828
67	S Coronæ . .	15	16	6	+ 31	50·8	..	6·5			Hencke . . 1860
68	R Coronæ . .	15	43	13	+ 28	33·4	350	6·2	13	∠	Pigott . . 1795
69	R Serpentis . .	15	44	43	+ 15	32·1	352	6·5	10	∠	Harding . . 1826
70	R Libræ . .	15	46	13	— 15	50·8	722	9	13·5	∠	Pogson . . 1858
71	R Herculis . .	16	0	4	+ 18	43·3	310	8·5	13·5		Argelander .
72	T Scorpii . .	16	9	17	— 22	38·6	..	7	13	∠	Auwers . . 1860
73	R Scorpii . .	16	9	54	— 22	36·6	648	9	14	∠	Chacornac . 1853
74	S Scorpii . .	16	9	55	— 22	34·6	364	9	13	∠	Chacornac . 1854
75	U Scorpii . .	16	14	59	— 17	34·5	..	9·5	13·5		Pogson . . 1863
76	U Herculis . .	16	20	3	+ 19	10·6	..	7	13		Hencke . . 1860
77	30 Herculis . .	16	24	22	+ 42	9·6	106	5	6		Baxendell . 1857
78	T Ophiuchi . .	16	26	18	— 15	51·3	..	10·5	13	∠	Pogson . . 1860
79	S Ophiuchi . .	16	26	46	— 16	53·3	229·3	3·3	13·5	∠	Pogson . . 1854
80	S Herculis . .	16	45	59	+ 15	9·9	305	7·5	12·5		Schönfeld . 1856
81	Hind's Nova, 1848	16	52	13	— 12	41·8	..	4·5	13·5	∠	Hind . . . 1848
82	R Ophiuchi . .	17	0	18	— 15	54·9	304·6	8	13·5	∠	Pogson . . 1853
83	α Herculis . .	17	8	42	+ 14	32·2	88·5	3·1	3·9		W. Herschel 1795
84	T Herculis . .	18	4	10	+ 31	0·1	160	7·9	13	∠	Argelander .
85	T Serpentis . .	18	22	28	+ 6	12·3	310	10·5	14	∠	Baxendell . 1860
86	* Coronæ Australis	18	24	25	— 38	50·2	years	3	6		Halley . . 1676
87	R Scuti Sobieskii	18	40	32	— 5	49·4	71·75	5	9		Pigott . . 1795
88	β Lyræ . .	18	45	15	+ 33	12·7	12·906	3·5	4·5		Goodricke . 1784
89	13 Lyræ . .	18	51	22	+ 47	46·7	46	4·2	4·6		Baxendell . 1855
90	R Aquilæ . .	19	0	7	+ 8	1·9	351·5	6·5			Argelander . 1855
91	T Sagittarii . .	19	8	43	— 17	11·0	..	8·5	12	∠	Pogson . . 1863
92	R Sagittarii . .	19	9	3	— 19	32·0	465	8	13	∠	Pogson . . 1858
93	S Sagittarii . .	19	11	49	— 19	15·0	..	10·5			Pogson . . 1860
94	R Cygni . .	19	33	20	+ 49	54·5	416·72	8	14	∠	Pogson . . 1852
95	11 Vulpeculæ . .	19	42	15	+ 26	59·4			Anthelm . . 1670

No.	Star.	R. A. 1870.			Decl. 1870.	Period.	Change of Magnitude.		Discoverer.
		h.	m.	s.			From	to	
96	Star in Vulpecula	19	43	8	+ 26 57.4	Days.	7	10	Rogerson . 1837
97	η Aquilæ . . .	19	45	51	+ 0 40.4	7.1763	3.6	4.4	Pigott . . 1784
98	χ Cygni . . .	19	45	33	+ 32 34.5	406.06	5	13 \angle	G. Kirch. . 1687
99	η Cygni . . .	19	51	26	+ 34 44.3	many yrs.	4.5	5.5	J. Herschel. 1842
100	S Cygni . . .	20	2	46	+ 57 36.7	324	9	13 \angle	Argelander . 1860
101	T Aquilæ . . .	20	5	39	+ 15 14.9	124 \pm	8.9	11.3	Baxendell . 1863
102	R Capricorni . .	20	4	11	+ 14 41.1	..	9.5	13.5	Hind . . . 1848
103	R Sagittæ . . .	20	8	7	+ 16 19.8	70.88	8.3	10.3	Baxendell . 1859
104	S Aquilæ . . .	20	8	39	+ 8 41.7	..	9	12 \angle	Hencke . . 1851
105	34 Cygni . . .	20	12	59	+ 37 38.3	18 y. \pm	3	6 \angle	Jansen . . 1600
106	24 Cephei (Hv.) .	20	24	48	+ 88 43.3	73 y. \pm	5	11	Pogson . . 1856
107	R Delphini . . .	20	37	6	+ 16 37.1	284	8	11	Baxendell . 1860
108	S Delphini . . .	20	39	19	+ 15 56.1	..	8.6	12	Baxendell . 1863
109	T Aquarii . . .	20	39	54	- 5 49.9	197	7.8	0	Goldschmidt 1861
110	U Capricorni . .	20	40	56	- 15 15.8	420	11	13.5 \angle	Pogson . . 1857
111	R Vulpeculæ . .	20	58	36	+ 23 18.3	147	8	13.5	Argelander .
112	T Capricorni . .	21	14	46	- 15 42.5	274	9	14 \angle	Hind . . . 1854
113	S Cephei . . .	21	36	43	+ 78 2.7	470	8.9	11.12	Winnecke .
114	μ Cephei . . .	21	39	31	+ 58 11.1	5 or 6 y.	4	6	W. Herschel 1782
115	S Pegasi . . .	22	15	39	+ 7 22.0	..	8.5	13.5 \angle	Hind . . . 1848
116	Star in Aquarius .	22	21	31	- 10 39.0	..	8	0	Runkel . .
117	δ Cephei . . .	22	24	20	+ 57 45.0	5.3664	3.7	4.8	Goodricke . 1784
118	S Aquarii . . .	22	50	8	- 21 1.8	..	8	11 \angle	Argelander . 1853
119	β Pegasi . . .	22	57	27	+ 27 22.6	31.5 or 43.4	2	2.5	Schmidt . . 1848
120	R Pegasi . . .	23	0	7	+ 9 49.1	378	8.5	13.5	Hind . . . 1848
121	T Cephei . . .	23	14	43	+ 55 19.9	..	8.2	8.8	Argelander . 1863
122	R Aquarii . . .	23	37	46	- 15 59.7	354 or 388.5	7	10 \angle	Harding . . 1810
123	R Cassiopeæ . .	23	51	49	+ 50 39.9	434.81	6	14 \angle	Pogson . . 1853

ADDENDA.

- * p. 17, after 101 M.—418. H II—14h. 10m. 22s., N. 35° 58' 40". A faint but very distinct nebula, like a star out of focus, 1766 H, under the right arm of Bootes, closely precedes the star 16 of Hevelius, a line from ϵ Bootis over ρ and rather more than as far again will touch a point preceding the nebula by 1".
- * p. 41, after 278 P. XIX—295 P. XIX.—19h. 43m. 41s., N. 33° 6' 0". a 6 $\frac{1}{2}$, very red; b 10, reddish; c 9, livid; dist. a - b , 165"; a - c , 238". A variable star; sometimes 5 mag.; period about 7 months; often mistaken χ , for closely f χ , a little s .
- * p. 51, after Double Star 37. 42.—16h. 35m. 5s., N. 49° 11' 53". a 6, orange; b 12, blue; dist. 20". A delicate triple star, between the left knee of Hercules and the head of Draco. $\frac{1}{3}$ from τ Herculis to β Draconis.

- * p. 57, after 86 H I—87 H. 1—10h. 53m. 0s., N. 29° 42' 0". A large round nebula, "no doubt, a distant globular cluster," H, 1-3rd the distance from ν Ursæ Majoris to γ Leonis.
- * p. 62, after 174 P. VI.—215 P. VI.—6h. 38m. 47s., N. 53° 10' 46"; a 8, bright yellow; b 11, dusky green; dist. 23". A delicate double star on the neck of the Lynx, less than 1-4th the distance from δ Aurigæ to ι Ursæ Majoris. 301 P. VI.—6h. 54m. 56s., N. 52° 57' 29"; a 6 and b 6 $\frac{1}{2}$, both white; dist. 3". A beautiful double star, 1-3rd the distance from δ Aurigæ to ι Ursæ Majoris.
- * p. 75, after Double Star 33. 33 P. XXII.—22h. 7m. 49s., N. 16° 31' 33". a 7 $\frac{1}{2}$, lucid yellow; b 10 $\frac{1}{2}$, sea-green; dist. 6" 5. A very delicate and beautiful double star, preceding the throat of Pegasus. A line from Algenib

carried just *n.* of Markab and as far again, less $1\frac{1}{2}^{\circ}$ will find it.

- * *p.* 79, before Double Stars 430 *h*. II.—23h. 7m. 52s., N. $3^{\circ} 45' 53''$. A faint nebula, near the eye of the southern or preceding Fish. "4' long by 1' in breadth."—*h*. No. 2216 H. preceded by a still fainter nebula in the *s.* *p.* quadrant. A line from μ Pegasi carried $\frac{1}{2}^{\circ}$ *p.* Markab, and as far again, will find it, 1° *n.* *f.* γ Piscium.
- * *p.* 80, after 145 P. 1.—1h. 33m. 45s., N. $25^{\circ} 3' 47''$. *a* 6, cream yellow; *b* 13, blue; dist. $12''$ 5. A beautiful double star, over the horn of Aries, rather less than 1-3rd the distance from β Arietis to β Andromedæ.
- * *p.* 89, before Double Stars—4. *h* VII— $5^{\circ} 3' 34''$, N. $16^{\circ} 29' 15''$. A tolerably condensed cluster, $21'$ to $25'$ in diameter,—“large, rich cluster; stars 12 to 15 mag. fills the field; the most compressed part is $42''$ 5, following the double star, and $3'$ *s* of it” H. 394 H. Over the right hand of Orion, $8\frac{1}{2}^{\circ}$ *f* Adelparan on the parallel of R. A.
- * *p.* 90, after χ 59.—4 *h* VII—5h. 4m. 16s., N. $16^{\circ} 32' 12''$. *a* 8, yellow; *b* 11, bluish; dist. $25''$. A very delicate double star, $42''$ preceding and $3'$ *n* of the cluster 42 *h* VII, $8\frac{1}{2}^{\circ}$ *f* α Tauri, on the parallel of R. A.

CORRIGENDA.

The reader is requested to correct with his pen the following errors in the Catalogue:—

- p.* 3, object 22 N. D.—For $13'$ write $19'$.
- p.* 6— β 22.—For 34m. write 24m.
- p.* 7, 1 N. D.—For $0^{\circ} 9' 10''$ write $0^{\circ} 0' 49''$.
- p.* 8, 2017.—For N. write S.—2035, for N. write S, and for Altair write Tarazed,— π 32 write π 52.
- p.* 9.—For II. write 11; 56 S. for $5'$ write $55'$; for 220 write 250.
- p.* 11, 93 M.—For N. write S.; ϵ Tursis, for N. write S.
- p.* 13, 33.—For 52m. write 32m.
- p.* 14, 52.—For $32'$ write $43'$; 179.—P. for $26'$ write $36'$; 222 P., for 51m. 65s. write 52m. 5s.
- p.* 15, 61.—N. for $30'$ write $10'$.
- p.* 16, ω 4.—N. for 27° write 37° ; and after ϵ 3 erase “which is;” 225 P. N., for $48'$ write $44'$.
- p.* 19, 1.—R. A. for 9h. write 4h.
- p.* 20.—For ϵ 38 write ϵ 41; ζ 16 N. for 11° write 18° .
- p.* 21, ϕ^2 53.—For 53 write ϕ^2 23; ν .—N. for $37'$ write $57'$ write $57'$ 37”.
- p.* 22, 29 *h*.—N. for $30'$ write $20'$.
- p.* 23.—Erase ξ before “Preceding 3 M;” 8 N., for $12' 3''$ write $5' 24''$.
- p.* 24, 25.—N. for $37^{\circ} 46' 35''$ write $36^{\circ} 59' 0''$; for α 205 write α 9.
- p.* 29, β 11 N.—For $17' 10''$ write $24' 24''$.
- p.* 30, 4.—For 20h. write 23h.; 55.—For 2h. 11m. 31s. write 2h. 3m. 31s.; and N. for $23'$ write $53'$.
- p.* 31, 42 *h*.—For 18m. write 2m.; β 8, for 56m. write 26m.; γ 35 N., for $0^{\circ} 12' 33''$ write $76^{\circ} 53' 0''$.
- p.* 33, η 31. S, for 11° write 10° .
- p.* 37, η 2.—For ϵ Bootis, write ϵ (44) Bootis.
- p.* 39.—After β 6 insert Albireo.
- p.* 40, ζ .—For “on the *p* side” write on the *f* side.
- p.* 41.—For Groombridge write Groombridge.
- p.* 42, 178 P.—For 34m. write 24m.
- p.* 43, 764 *h*.—R. A. for 40m. 53s. write 36m. 23s.
- p.* 45, λ 2.—N. for 3° write 6° .
- p.* 45.—For 14, write I^4 16.
- p.* 46, 32.—S. for $1'$ write $21'$.
- p.* 47, 98 P.—For 23h. write 3h.; for $4'$ write $8'$.
- p.* 48, α 66.—N. for $17'$ write $11'$; and after α — b $4''$ 9 insert α — c $73''$.
- p.* 49, 20.—N., for 7° write 17° .
- p.* 50, 5 N.—For 17h. write 16h.
- p.* 52, 95.—For 15m. write 55m.; for Centaurus write Centaurus; 68 M.—S., for $52' 45''$ write $59' 22''$.
- p.* 56, ϕ 74.—For N. write S., and for $38' 28''$ write $54' 44''$.
- p.* 57, 83.—N., for $4' 53''$ write $44' 49''$.
- p.* 66, 81 P. S.—For $0' 58''$ write $4' 18''$.
- p.* 68.—For τ 69, insert S.; 19, for S. write N.
- p.* 70.—For portion write position.
- p.* 71, γ .—For S. 16° write N. 6° .
- p.* 72.—For 133 write $133''$.
- p.* 77, ϵ .—N., for $56'$ write $36'$.
- p.* 81.—For Semidith write Schmidt.
- p.* 83, ζ .—N., for $28'$ write $48'$; 21 M., for N. write S.
- p.* 84, 21 M.—R. A., for 7h. write 17h.
- p.* 86.—For β 9 write β 8.
- p.* 87, β .—N., for 10° write 15° .
- p.* 95.—For η 35 write η 85.
- p.* 97, 12th line.—For Polaris, &c., write Polaris is of the same altitude as the latitude of the place, &c.; 250 H.—R. A., for 38m. write 40m.; N. for $2'$ write $14'$.
- p.* 99, 7th line.—For precedes write follows.

INDEX TABLE OF THE CONSTELLATIONS IN THE ORDER OF THE CATALOGUE.

Name.	Genitive Case.	Catalogue Page.	Name.	Genitive Case.	Catalogue Page.
Andromeda	Andromedæ	1	Gemini.....	Geminorum	47
Anser	Anseris	4	Hercules.....	Herculis	49
Antinous	Antinoi	4	Hydra.....	Hydræ.....	52
Aquarius	Aquarii.....	5	Lacerta	Lacertæ.....	54
Aquila	Aquilæ	7	Leo.....	Leonis	54
Argo Navis	Argûs Navis	10	Leo Minor	Leonis Minoris...	57
Aries.....	Arietis	12	Lepus	Leporis	58
Auriga	Aurigæ.....	14	Libra	Libræ	59
Bootes	Bootis	16	Lynx	Lyncis	61
Camelopardus	Camelopardi	19	Lyra.....	Lyræ	62
Cancer	Canceri	20	Monoceros	Monocerotis	64
Canes Venatici	Canum Venati- corum	22	Ophiuchus	Ophiuchi.....	67
Canis Major.....	Canis Majoris.....	24	Orion	Orionis	69
Canis Minor ...	Canis Minoris ...	25	Pegasus	Pegasi	73
Capricornus	Capricorni.....	26	Perseus	Persei	75
Cassiopea	Cassiopeæ	27	Piscis Australis		81
Cepheus	Cephei	31	Pleiades	Pleiadum.....	81
Cetus	Ceti	32	Pyxis Nautica		82
Clypeus Sobieski...	Clypei Sobieski ...	35	Sagitta	Sagittæ	82
Coma Berenices ...	Comæ Berenices...	36	Sagittarius	Sagittarii	83
Corona Borealis	Coronæ Borealis .	37	Scorpio.....	Scorpionis	85
Corvus	Corvi.....	38	Serpens	Serpentis	86
Crater	Crateris...	38	Sextans	Sextantis	88
Cygnus	Cygni	39	Taurus	Tauri.....	89
Delphinus	Delphini	41	Taurus Poniatowski	Tauri P.....	91
Draco	Draconis	42	Triangulum	Trianguli	92
Equuleus.....	Equulei.....	45	Ursa Major.....	Ursæ Majoris	93
Eridanus	Eridani.....	45	Ursa Minor.....	Ursæ Minoris .. .	97
Fornax Chemica....	Fornacis	47	Virgo	Virginis.....	98
			Vulpecula..	Vulpeculæ	103

THE ASTRONOMICAL OBSERVER.

ANDROMEDA.

AN extensive constellation in the northern hemisphere, distinguished by three bright stars, α , β , γ , nearly in a straight line. α is one of the stars of the great square of Pegasus, and is sometimes called δ Pegasi. The well-known figure of the Plough, or Charles's Wain, in Ursa Major, is traced out on a much grander scale, and with brighter stars,—by the Seven Stars—Algol in Perseus, Almaach, Mirach, Alpherat in Andromeda, Scheat, Algenib, and Markab in Pegasus. Andromeda is remarkable for several first-class nebular and stellar objects. The northern part never sets to London. The constellation rises in May, culminates in October, and partially sets in April; Almaach continuing to sweep along the horizon. Boundaries—north, Cassiopea and Cepheus; east, Perseus and Triangulum; south, Pisces and Aries; west, Pegasus and Lacerta.

Nebulæ.

31 Messier (Epoch 1865), Right Ascension—0h. 35m. 26s., North Declination, $40^{\circ} 31' 50''$. One of the most splendid of all the nebulæ. Supposed by Sir William Herschel to be the nearest of the nebular objects to our system, an opinion not confirmed by later observers; most difficult to figure or describe; resembles a double cone, base to base, the apices undefined and dissolving into fire-mist, while the nucleus or central region rises up to the eye like a conical mountain of light. At a considerable distance to the left of the nucleus, and beyond the precincts of the double cone-shaped mass, there are seen in large telescopes, two nearly parallel dark rifts or bands, both on the north preceding side, and in the direction of its major axis, about $1\frac{1}{2}'$ broad, by nearly 1° in length. These longitudinal channels have been well observed by the Earl of Rosse in the Parsonstown 6-feet reflector, and also by Bond of the United States, and by Secchi of Rome. Bond's figure, as given in Chambers's "Hand-book to Astronomy," misleads the observer to look for the bands in the body or central portion of the nebula, whereas they really lie quite beyond it. As seen in a $9\frac{1}{2}$ -aperture refractor telescope by Slater of London, in the possession of Samuel Younge, Esq., of Brinkcliffe Edge, Sheffield, on the night of the 4th January, 1864, the inner chasm could be distinctly traced through the whole field of a lunar eye-piece, and showed glittering stars on its bed, like brilliants on a dark belt; the outer chasm was also clearly visible, but could not be traced to the same extent. Lord Rosse conjectures that the nebulous matter

seen between these parallel bands may be a ring-nebula, much more distant, seen on its edge, and having only an optical connection with the great nebula. There are two companion nebulae to 51 M., 32 M., and 18 H. V., and all three are of so well defined shape as to disprove the idea entertained by some, that they are all only projections of the surface of a vast underlying and invisible nebula, as extended as the nebula in Orion or Argo. Lord Rosse observes a granulated or mottled surface in the nucleus of 51 M., but it remains still classed amongst the unresolved nebulae, although numerous stars lie scattered over its mass, close up to its dazzling centre. The axis of direction trends south preceding and north following. 31 M. is easily found by a non-equatorial telescope on the star-pointer system, of which it furnishes a good illustration. It is pointed at by the stars β and μ , at the same distance beyond μ , where it will be found a little preceding ν , and strikes the naked eye as a dull patch of light. The pointer-line from β is a perpendicular to the base-line which joins γ and β . This object has been placed foremost on this list on account of its superior interest. The two following objects are the companion nebulae.

32 M.—The close companion nebula to 31 M. in the same field, with a low power, at a distance of 26' nearly due south of the nucleus of the great nebula. "Extremely bright, pretty large, 30" or 40" in diameter."—H. Resembles a star out of focus, has a faint 13 mag. star following; resolved into stars by Lord Rosse.

18 H. V.—Oh. 33m. 3s., N. $40^{\circ} 56' 52''$. A large oval nebula, the distant companion of 31 M., rather faint, especially after the eye has seen the great nebula. "Has a faint suspicion of a nucleus."—H. Major axis extending north and south. All three nebulae may be included in the field of the telescope, with a very low power. A little to the *n. p.* 31 M.

18 H. IV.—23h. 19m. 25s., N. $41^{\circ} 47' 58''$. One of the spiral nebulae observed by the Earl of Rosse. Has the appearance of two concentric elliptical rings; the inner one seen on the flat, and the outer on the edge, with a bright central nucleus on a dark ground. "Looks as if it had a double outline, not perfectly round; light equable; hazy at its edges."—H. "The star in the centre and the spiral arms distinctly seen: the outlying portions of the sketch are parts of spiral branches."—Lord Rosse, *Observ. Phil. Trans.* 1862. Very difficult to find by star-pointers, lies between the stars 10 and 13 on a line to κ , which is on the left hand of Andromeda; 2° less than mid-distance from η Pegasi to α Cassiopeae. (See the large maps of the Society for the Diffusion of Useful Knowledge.)

19 H. V.—2h. 14m. 10s., N. $41^{\circ} 43' 5''$. An elliptical nebula with a dark line through the central region, in the direction of its major axis; supposed to be a flat ring seen obliquely. Discovered by Miss Herschel with a Newtonian reflector of only 27-inch focal length, power 30, accessible to a moderate telescope. It will be found a little more than $\frac{1}{2}$ the distance from Almaach to Algol, which is in the head of Medusa, about 1° *n.* of the star 61 Andromedae.

Double Stars.

α 21 Alpherat, R. A.—Oh. 1m. 25s., N. D. $28^{\circ} 21' 5''$. *a* 1, bright white; *b* 11, purple; distance 64"·8. A splendid star, the lucida of the constellation, with a distant minute companion, near the eye of Andromeda. The brightest star of the four which constitute the great square of Pegasus, at the *n. f.* angle.

β 43 Mirach.—1h. 2m. 10s., N. $34^{\circ} 54' 20''$. *a* 2, fine yellow; *b* 12, pale blue; dist. 225". The central of the three bright stars which mark the constellation of Andromeda. One of the pointers to 31 M.

γ 57 Almaach.—1h. 55m. 37s., N. $41^{\circ} 40' 55''$. a $3\frac{1}{2}$, orange; b $5\frac{1}{2}$, emerald green; dist. $11''$. One of the very finest stellar objects in the heavens, first seen double by C. Mayer, 1778. The companion b was discovered to be double in 1842; distance of the components $b-c$, $0''\cdot5$; colours, pale yellow and smalt-blue. " γ^2 Andromedæ, beautifully separated, and the contrast of colours most distinctly seen. That b appears green under low powers, is owing to the blending of the blue and yellow tints of the components b and c ."—Sir W. R. Murray, in *Smyth's Speculum Hartwellianum*. The clear separation and satisfactory definition of γ^2 Andromedæ is now regarded as one of the highest tests of a good telescope. Almaach is on the lady's right ankle, and the last of the three bright stars in Andromeda.

δ 31.—0h. 32m. 0s., N. $30^{\circ} 8' 25''$. a 3, orange; b $11\frac{1}{2}$, dusky; dist. $122''$. A bright star with a distant companion. δ is the central of three vertical stars that stand nearly midway in the line from α to β .

κ 19.—23h. 33m. 46s., N. $43^{\circ} 35' 20''$. a 5, brilliant white; b 14, dusky; c 12, ash-coloured; dist. $a-b$, $47''$, $a-c$, $98''\cdot5$. A delicate triple star, on the lady's left hand, and one of the pointers to the nebula 18 μ IV. b and c are considered very difficult objects. κ with λ and ψ form a small triangle in the northern part of Andromeda, at the vertex of a nearly equilateral triangle with the base line drawn from β to δ .

μ 37.—0h. 49m. 15s., N. $37^{\circ} 46' 0''$. a 4, bright white; b 16, dusky grey; dist. $45''$ ($49''\cdot19$, Challis). A most delicate double star, 4° $n. p. \beta$. On the line midway from β to the nebula 31 M. b is an object of extreme difficulty. "Following on the parallel at about 20m. is a very neat double star of the 8th and 11th mag. $12''$ apart; colours, pale yellow and green."—Smyth.

π 29.—0h. 29m. 40s., N. $32^{\circ} 58' 25''$. a $4\frac{1}{2}$, fine white; b 9, blue; dist. $36''$. A fine double star. "Ptolemy was *right* in stating it to be on the shoulder of Andromeda; but as the figures of the constellations are drawn on many modern celestial maps with the fronts towards the observer, π appears to be situate on the breast."—Smyth. π is the uppermost of the three stars in a vertical line between α and β .

" ψ 20.—23h. 39m. 20s., N. $45^{\circ} 40' 15''$. a 5 and b 5, both white, of the same class as 56 and 203, P. 1."—Webb. ψ forms a small triangle with κ and λ , near the lady's left hand.

22.—0h. 3m. 20s., N. $45^{\circ} 13' 20''$. a 5, white; b 8, pale yellow; c 9; distance $b-c$, $4''\cdot9$. a is a pointer to $b-c$, in the $n. p.$ quadrant, in a fine field. 22 is just double the distance from β to 31 M., and in the same direction.

36.—0h. 47m. 45s., N. $22^{\circ} 53' 55''$. a 6, bright orange; b 7, yellow; dist. $1''$. "A very close double star, a miniature of η Coronæ, in the lady's right elbow."—Smyth. "A close binary star, measured by Struve, 1832; both stars deep orange."—Bishop. "Though the measures of this golden pair of twin suns are difficult in operation, they can be satisfactorily made. A direct angular variation of 20° in 17 years, under my own eye, leaves its binarity undoubted. The object is certainly widening in distance."—Smyth, 1860, *Spec. Hart.* 36 is found closely $n. p. \eta$, between η and ζ on the line to α .

55.—1h. 45m. 11s., N. $40^{\circ} 3' 49''$. a $5\frac{1}{2}$, yellow; b 16, bluish; dist. $25''$. A most delicate double star. The minute companion extremely difficult, 3° $s. p.$ Almaach, and a little $s.$ of the line to Mirach.

56 and 203.—1h. 48m. 8s., N. $36^{\circ} 38' 18''$. a 6, and b 6, both yellow; dist. $176''$. Suspected binary, 5° $s.$ of γ , a little $p.$ the line from Almaach to α Trianguli.

59.—2h. 2m. 46s., N. $38^{\circ} 24' 6''$. a 6, bluish white; b $7\frac{1}{2}$, pale violet; dist. $16''$. A neat double star. Nearly midway on the line from Almaach to β Trianguli, or halfway on the line from Algol to Mirach.

61 P. II., and 62 P. II.—2h. 14m. 26s., N. $40^{\circ} 47' 5''$. a 7, pale yellow; b 11, pale lilac; dist. $50''$. 61 points to 62, a wide 8 mag. pair. $\frac{1}{2}$ the distance from Almaach to Algol, 1° s. of the line of direction. This star closely follows the nebula 19 H. V.

147. H. III.—0h. 3m. 0s., N. $25^{\circ} 9' 30''$. a 10, and b 11, both pale blue; dist. $28''$. A double star in a coarse cluster, on the crown of the lady's head. Another double star in the upper part of the field, marked 147 II., on the Maps of the Society for the Diffusion of Useful Knowledge.

171 P. XXIII.—23h. 37m. 52s., N. $45^{\circ} 34' 12''$. a 7, topaz-yellow; b 13, blue; c 10, plum-colour; dist. $a-b$, $5''$, $a-c$, $175''$. A very delicate double star with a distant companion; close to ψ in the n. of Andromeda, near the lady's left hand.

175 and 176 P. V.—0h. 39m. 10s., N. $30^{\circ} 12' 26''$. a 8, and b 8, both pale yellow; dist. $46''$. A wide double star $1\frac{1}{2}^{\circ}$ f. on the lady's right side.

240 P. XXIII.—23h. 51m. 21s., N. $23^{\circ} 36' 3''$. a $8\frac{1}{2}$, pale white; b 9, yellowish; dist. $9''\cdot 4$. A fine double star on the body of Pegasus, and strangely included in the objects of Andromeda, 5° s. p. Alpherat. Close under the star ψ 84 Pegasi.

ANSER.

A small asterism mingled with Vulpecula, lies between the head of the Swan and the Eagle, pointed at by the three bright stars of Aquila, less than one-third the distance from Altair to Vega, and just midway between Altair and Sulaphat in Lyra. The principal star is 3° s. of β Cygni. Anser has only a few telescopic objects of much interest, but is remarkable for its fine low power fields.

Cluster.

21 H. VIII.—19h. 21m. 32s., N. $24^{\circ} 52' 39''$. A large cluster on the neck of the Goose. "The leading stars assume the form of the Greek capital letter Ω more strongly than 17 Messier."—Smyth. 3° s. of Albireo (β Cygni) closely p. the stars 6 and 8.

Double Stars.

6.—19h. 23m. 5s., N. $24^{\circ} 23' 40''$. a 4 mag., deep yellow, 3° nearly s. of β Cygni, a little p. indicating a very rich neighbourhood. 6 is properly the lucida of Vulpecula.

8.—22h. 23m. 18s., N. $24^{\circ} 29' 30''$. $5\frac{1}{2}$ mag., pale yellow. 8 with 6 forms a double star to the naked eye, and are inserted as pointers.

4, 5, 7.—19h. 19m. 32s., N. $19^{\circ} 42' 12''$. A group, 6, $6\frac{1}{2}$, 7 mag., in a very magnificent region, 8° s. of β Cygni.

128 P. XIX.—19h. 20m. 34s., N. $19^{\circ} 37' 32''$. a $6\frac{1}{2}$, topaz-yellow; b 13, deep blue; dist. $25''$. A delicate and difficult double star in the group 4, 5, 7.

ANTINOUS

Is generally considered a portion of the constellation of Aquila, and not easily distinguished from it; lies immediately south, and contains one variable star, η ; period about 7 days, 4 hours, 14 minutes, increasing in 57 hours, and occupying

115 hours in its decrease (Argelander). The Milky Way cuts the Equator in the right hand of Antinous, R. A. 19h. 15m. Antinous rises in May, and sets in September.

Cluster.

11 M., R. A.—18h. 43m. 52s., S. D. $6^{\circ} 25' 40''$. A very beautiful cluster unfolding like a fan, 10' or 12' in diameter—stars 11 magnitude, excepting 1 of the 8th. "It is broken up into five or six distinct groups, with rifts or cracks between them; a glorious object."—H. "Resembles a flight of wild ducks."—Smyth. It precedes the right leg of Antinous, but is properly on the Shield of Sobieski $4^{\circ} p.$ and $1^{\circ} s.$ of λ Antin. λ Antin. is easily found and is an excellent pointer to many fine objects. A line from γ Aquilæ to δ Aquilæ, and continued as far again, will strike λ Antinoi.

Double Stars.

12 P., XX.—20h. 4m. 40s., S. $0^{\circ} 31' 26''$. a 8, b 9, both pale grey; dist. $54''\cdot 2$. A wide double star on the left hand of Antinous, $1^{\circ} n.$ of θ Antinoi, on the bow of Antinous, pointed at by the three bright stars of Aquila.

26 P. XX.—20h. 5m. 55s., N. $0^{\circ} 27' 55''$. a $6\frac{1}{2}$, b 7, both white; dist. $3''\cdot 5$. A fine double star, on the left arm of Antinous, $2^{\circ} n.$ of θ , on the same parallel of declination.

116 P. XX.—20h. 17m. 58s., N. $0^{\circ} 37' 59''$. a $7\frac{1}{2}$, white; b 12, grey; dist. $30''$. A difficult double star. b is a very faint object, between the head and bow of Antinous, $3^{\circ} f.$ 26 P. On the same parallel of R. A.

139 and 140 P. XX.—20h. 20m. 28s., S. $2^{\circ} 33' 8''$. a $7\frac{1}{2}$, and b 8, both white; dist. $60''$. A wide double star, each of the components having a minute companion; thus forming a trapezium. "Of these, one of the 12 mag. is nearest to a , about $40''$ distant."—Smyth.

185 P. XIX.—19h. 29m. 21s., S. $10^{\circ} 43' 34''$. a 9, bright yellow; b 10, cerulean blue; c 12, violet tint; dist. $a-b$, $3''\cdot 2$; $a-c$, $8''$. "A curious triple star, the last star of a telescopic trifolium. Similar to that in the hand of Aquarius."—H. Closely $f.$ 37, Antin. A line from ϵ Delphini (the lowest bright star in the Dolphin) carried over θ Antin., and nearly as far again, will touch upon it.

186 P. XIX.—19h. 29m. 21s., S. $10^{\circ} 27' 22''$. a $7\frac{1}{2}$, pale white; b 9, sky-blue; dist. $3''\cdot 8$. A neat double star. "Brighter and more open than 185."—Smyth. Closely following 185.

197 P. XVIII.—18h. 42m. 27s., S. $6^{\circ} 3' 47''$. a 7, orange; b 10, cerulean blue; dist. $99''$. On the upper part of the Shield of Sobieski. $4^{\circ} p.$ and $1^{\circ} s.$ of λ . In the field with 11 M. under a low power.

274 and 275 P. XVIII.—18h. 55m. 48s., S. $0^{\circ} 53' 55''$. a and b both 9, and both white; c 16, blue; dist. $a-b$, $25''$, $b-c$, $2''$. Struve discovered b to be closely double, thus rendering the object a very difficult triple star. Midway between λ Antin. and θ Serpentis, in the tip of the Serpent's tail.

AQUARIUS.

A very extensive constellation in the southern hemisphere, embracing a considerable portion of the heavens, has very few stars visible to the naked eye, but possesses some remarkably fine telescopic objects; consists of 108

stars (according to Flamsteed), 4 of the 3rd, 6 of the 4th, the rest of smaller magnitudes. Aquarius rises in June, culminates in September, and sets in November. N. Pegasus, Equuleus, and Delphinus; S. Piscis Australis; E. Pisces and Cetus; W. Capricornus and Antinous.

Nebulæ.

1 H. IV. R. A.—20h. 56m. 48s., S. $11^{\circ} 53' 31''$. A fine elliptical nebula apparent diameter $20''$. "This object is bright to the very disc, and but for its pale blue tint would be a very miniature of Venus."—Smyth. Lord Rosse observes appendages like a ray at each side; Sir John Herschel thinks if this object be only the same distance as the stars, it would fill a space equal to the whole orbit of the planet Uranus! A line from α carried a little *s.* of β and produced within 1° of as far again, will strike it, 1° *p.* the star ν (13 "S&d. Bula").

2 M. H. 2125.—21h. 26m. 27s., S. $1^{\circ} 25' 35''$. A resolvable nebula. "A most glorious cluster of stars, 15 mag., compressed up to a blaze; its most crowded parts take 6s. to pass the wire, but there are straggling stars—there must be many thousands of stars, like a heap of fine sand."—H. As figured by Lord Rosse, it is one of the richest and largest clusters in the whole heavens. It is situated in rather a blank region, and produces a fine effect on the eye of the observer on its entrance into the field of the telescope. 5° *n.* of β and 1° *f.* the parallel of declination, or, a line from η carried just *n.* of α and as far again, will place it in the field.

Double Stars.

α 34 Sadal-Melik.—21h. 58m. 16s., S. $0^{\circ} 58' 31''$. α 3, pale yellow; β 13, grey; dist. $116''$. A fine star with a distant minute companion, on the left shoulder of Aquarius. A line from Alpherat over Markab, and produced 1° more than as far again, will find it.

β 22 Sadalsûd.—21h. 34m. 26s., S. $6^{\circ} 10' 0''$. α 3, pale yellow; β 15, blue; dist. $25''$. A standard star with a minute attendant, on the right shoulder of Aquarius; β a most difficult object. ϵ Pegasi in the nostril of the horse, together with η Aquar. and β Aquar., form an equilateral triangle. β Aquar. is situate at the *s. p.* angle.

γ 48 Gjenûla.—22h. 14m. 40s., S. $2^{\circ} 4' 3''$. α 4, greenish tinge; β 14, purple; dist. $40''$. A wide and very delicate double star, the companion a severe test-object. In the left hand of Aquarius, the most southern of a group of four stars; 4° *f.* and 1° *s.* of the parallel of α .

ζ 55.—22h. 22m. 10s., S. $0^{\circ} 42' 37''$. α 4, flushed white; β $4\frac{1}{2}$, creamy; dist. $2''\cdot7$, Smyth; $3''\cdot5$, Bishop; $3''\cdot9$, Dawes. A fine binary star, discovered by Sir W. Herschel; period about 750 years. Must be widening, as it is now easy of resolution with power 150. Situated in a triangle of stars, easily found, 6° *f.* α nearly on the parallel, a little *n.*

τ 69.—22h. 40m. 33s., S. $14^{\circ} 46' 4''$. α 6, white; β $9\frac{1}{2}$, pale garnet; dist. $29''\cdot7$. The companion very difficult, "almost as difficult as δ Equulei."—Dawes. 2° *n.* and $1\frac{1}{2}^{\circ}$ *p.* Skat (δ 76), on the left knee of Aquarius. Skat is a bright solitary star in a blank region, 14° due north of Fomalhaut.

τ 71.—22h. 41m., S. $14^{\circ} 30'$. "A beautiful orange; 5th mag. star, with a distant companion."—Webb. Dist. $132''\cdot5$. "Small star, faint, not quite so difficult as τ 1."—Dawes. Close to τ 1, a little *n.*

ψ 91.—23h. 8m. 48s., S., $9^{\circ} 49' 22''$. α $5\frac{1}{2}$, topaz-yellow; β 9, sky-blue; dist. $49''\cdot5$. The first of a group of three stars ψ 1, 2, 3, in the upper part of the stream from the vase of Aquarius. Nearly midway between α Aquarii and β Ceti.

1.—20h. 32m. 29s., N. $0^{\circ} 9' 10''$. a $5\frac{1}{2}$, topaz; b 13, bluish; a and b point to c 14, ruddy; dist. $a-b$, $20''$, $a-c$, $35''$. A very delicate triple star, on the Equinoctial, $1\frac{1}{2}^{\circ}$ n. of the star 71 Antin., which $f.$ θ Antin. by 7° . This object is pointed at by the stars ϵ Pegasi and α Equulei, and will be found at 1° more than the same distance beyond.

4.—20h. 44m. 16s., S. $6^{\circ} 7' 45''$. a 6, pale yellow; b 8, purple; dist. $0''.5$. An exceedingly close and difficult binary star, period not yet ascertained. It will be found 4° due north of the wide pair to the naked eye (ϵ and μ Aquar.), which lies between β Aquar., and α Capricorni.

12.—20h. 57m. 46s., S., $6^{\circ} 21' 19''$. a $5\frac{1}{2}$, yellowish white; b $8\frac{1}{2}$, light blue; dist. $2''.8$. A close double star, between the Water-bearer's scarf and the Horse's head, 7° p. β Aquar. Nearly on the parallel, and on the line to the double star 4, the last object.

"24 $f.$ 2 M.—a little n. a 7, b 10, a double star in the head of Aquarius." "About 21h. 38m., S. $0^{\circ} 30'$. A rich region will be found, where a low power will include three double stars at once."—Webb. 24 precedes a by 7° nearly on the parallel.

29.—21h. 55m. 3s., S. $17^{\circ} 36' 47''$. a 6 and b 8, both brilliant white; dist. $4''.5$. A very beautiful double star; components nearly equal. On the tail of the southern fin of the Sea-goat. Difficult to find by star-pointers; a line from β Aquar., over λ , and produced as far again, will find it.

41.—22h. 6m. 50s., S. $21^{\circ} 44' 41''$. a 6, topaz-yellow; b $8\frac{1}{2}$, blue; dist. $4''.5$. A beautiful double star, just midway on a line from δ Capricorni (49 Mashira Post) to ϵ Piscis Australis, which is on the line to Fomalhaut.

53.—22h. 19m. 13s., S., $17^{\circ} 25' 34''$. a $6\frac{1}{2}$ and b $6\frac{1}{2}$, both pale white; dist. $9''.9$. A fine object on the right thigh of Aquarius, 7° p. Skat (δ Aquar.), and 1° s. Fomalhaut, Skat, and Mashira Post (δ Capricorni), make a right-angled triangle, the right angle at Skat.

69 P. XXIII.—23h. 16m. 47s., S., $9^{\circ} 12' 1''$. a 8, b $8\frac{1}{2}$, both flushed white; b has a reddish tinge; dist. $7''.5$. In the middle of the urn stream, a fine object 1° f. the group $\psi^1, ^2, ^3$, a little north.

94.—23h. 11m. 59s., S. $14^{\circ} 11' 33''$. a 6, pale rose-colour; b $8\frac{1}{2}$, light emerald; dist. $14''$. A beautiful pair; $4\frac{1}{2}^{\circ}$ due s. of the group $\psi^1, ^2, ^3$.

107.—23h. 39m. 0s., S. $19^{\circ} 25' 57''$. a 6, bright white; b $7\frac{1}{2}$, purplish; dist. $5''.5$. A suspected binary star. In the second and lower group which lies on the urn-stream, midway between Skat (δ Aquar.) and Diphda (β Ceti), in the tail of Cetus.

200 P. XXII.—22h. 35m. 59s., S. $9^{\circ} 1' 2''$. a 7, b $8\frac{1}{2}$, both white; dist. $2''.7$. A very neat double star in the mouth of the urn, midway between Skat and the bright pair, to the naked eye, η and ζ in the left hand of Aquarius.

209 P. XXII.—22h. 38m. 15s., S. $10^{\circ} 21' 12''$. a 8, white; b $12\frac{1}{2}$, violet tint; dist. $10''$. A very delicate double star. On the same line as 200, the last object. Rather more than 1° nearer to Skat than 200.

219 P. XXII.—22h. 40m. 52s., S. $4^{\circ} 55' 40''$. a $7\frac{1}{2}$, yellow; b 8 and c 9, both flushed white; dist. $a-b$, $4''.2$, $a-c$, $55''$. c is a most difficult object. 219 is found 3° following Situla (κ 63), which is just midway between a and the remarkable group $\psi^1, ^2, ^3$, and is marked 72 *Trip.* on Malby's Globe Atlas.

A Q U I L A .

A small but very rich constellation, interwoven with, and properly embracing Antinous, and easily recognized by a line of three bright stars, of which the

central one is Altair, $1\frac{1}{2}$ magnitude, the other two of the 3rd mag. They point to Vega in Lyra, and thence to Alwaid in the head of Draco. Aquila embraces 74 stars, and lies just above the Equinoctial. It rises in April, culminates in July, and sets in November. N. Sagitta and Vulpecula; S. Antinous and Scutum Sobieski; E. Pegasus and Delphinus; W. Serpens and Taurus Poniatowski.

Clusters.

38 H. VI. R. A.—19h. 25m. 6s., Dec. N. $8^{\circ} 57' 5''$. A resolvable nebula, broken up into a fan-shaped cluster by powerful telescopes; stars 8 to 15 magnitude. "It is like a nebula well resolved, and is a curious object."—H. On the Eagle's back, $4\frac{1}{2}^{\circ}$ p. a., nearly on the parallel of R. A.

2017.—18h. 33m. 53s., N. $4^{\circ} 52' 8''$. A large and pretty rich cluster of stars, broken up into two or three clusters, by a rift or chasm through the centre, like 13 Messier, as observed by Lord Rosse. 70 or 80 stars of all magnitudes; fills the whole field over the Shield of Sobieski, 6° p. the pointer star λ Antinoi; a little n. of the parallel of R. A.

2024 H.—18h. 49m. 35s., N. $10^{\circ} 11' 21''$. A fine cluster, in a rich field, seems isolated between the two streams of the Milky Way. In a small telescope has very much the appearance of a large nugget sparkling with bright points on its surface. A line from Albireo in the head of the Swan, produced between the wide pair of stars ϵ and ζ , in the Eagle's tail, and 4° beyond, will find it.

2035 H.—19h. 9m. 53s., N. $1^{\circ} 9' 27''$. A loose cluster, below the southern wing of the Eagle. Nearly midway between δ Aquilæ and λ Antinoi, 1° p. the line of direction; or, it is found at the preceding angle of an equilateral triangle formed on the base-line from Altair to θ Antin, the cluster at the preceding angle.

Double Stars.

α 53 Altair.—19h. 44m. 10s., N. $8^{\circ} 30' 21''$. a $1\frac{1}{2}$, pale yellow; b 10, violet tint; dist. $152''\cdot6$. A splendid star, with a distant companion; supposed variable. The central of the three bright stars which mark the constellation of Aquila.

β 60 Alshain.—19h. 48m. 39s., N. $6^{\circ} 4' 28''$. a $3\frac{1}{2}$, pale orange; b 10, pale grey; dist. $175''$. A fine star, with a distant companion. On the Eagle's head. The lowest of the three prominent stars in Aquila.

γ 50 Tarazed.—19h. 39m. 49s., N. $10^{\circ} 17' 5''$. a 3, pale orange; b 12, dusky; dist. $136''$. A beautiful star; supposed variable. On the Eagle's back. The uppermost of the three bright stars, 2° n. p. a. A splendid field in the *Via Lactea*.

δ 30.—19h. 18m. 40s., N. $2^{\circ} 48' 32''$. a $3\frac{1}{2}$, white; b 12, livid; dist. $1''\cdot5$. And there is also a very minute star c , which constitutes δ a triple star, and a severe test-object. "With the Elchies telescope, in the triple star δ Aquilæ, the closer companion was identified by Professor Smyth; but it was found that it had decreased in brilliancy from the 12th magnitude, May, 1833, to the 16th, 1862." δ is on the pinion of the Eagle's south wing, midway from Altair to λ Antin., in a gorgeously rich neighbourhood. H.'s 2040 is found 1° n. of δ .

ζ 17.—18h. 59m. 10s., N. $13^{\circ} 39' 53''$. a 3, greenish tint; b 11, livid; dist. $8''\cdot4$. One of the two bright stars in the Eagle's tail. The nearer star to Altair.

π 32.—19h. 42m. 20s., N. $11^{\circ} 28' 58''$. a 6, pale white; b 7, greenish; dist. $1''\cdot7$. A very close and beautiful double star. A miniature of Castor. 3° n. of Altair. $\frac{1}{2}^{\circ}$ p. the parallel of declination.

2 Flamsteed.—18h. 34m. 53s., S. $9^{\circ} 10' 47''$. *a* 5, yellowish white; *b* 11 purple; dist. $55''$. This star is to be distinguished from the next object, which is Piazzi's 2. 2 Flamsteed is on the Shield of Sobieski, nearly 1° s. of the star 3. A line from ν Aquilæ, which is on the equator, produced in a direction, just north of λ Antin., and as far again, will touch it.

2 Piazzi XX.—20h. 2m. 59s., N. $16^{\circ} 31' 2''$. *a* 7, pale topaz; *b* 10, lucid blue; dist. $5''\cdot 9$. One of a group of stars, properly in Sagitta. A suspected binary. A line from δ Aquil. over γ and produced 2° more than as far again, will find it.

5.—18h. 39m. 40s., N. $1^{\circ} 6' 7''$. *a* 7, white; *b* 8, lilac; *c* 14, blue; dist. *a*—*b*, $13''\cdot 3$, *a*—*c*, $30''$. A delicate triple star. *c* is a very minute object, and considered a severe test for a moderate telescope. In the centre of a nearly equilateral triangle of stars formed by λ Antinoi, θ Serpentis, and η Serpentis.

II.—18h. 52m. 53s., N. $13^{\circ} 26' 52''$. *a* 7, pale white; *b* 10, smalt-blue; dist. $19''$. A delicate double star, on the Eagle's tail, at the *p.* angle of a small equilateral triangle formed with ϵ and ζ . $1\frac{1}{2}^{\circ}$ due s. of ϵ .

15.—18h. 57m. 50s., S. $4^{\circ} 13' 46''$. *a* 6, yellowish white; *b* $7\frac{1}{2}$, reddish purple; dist. $35''$. A remarkably fine object, 1° n. of λ Antin. A line from γ Aquilæ produced just s. of δ Aquilæ, and the same distance again beyond, will find λ Antin.

23.—19h. 11m. 40s., N. $0^{\circ} 50' 31''$. *a* 6, light orange; *b* 10, grey; dist. $3''$. A beautiful but rather difficult object, on the right arm of Antinous. A line from μ , carried a little *p.* δ , and produced half as far again, will find it.

28.—19h. 13m. 41s., N. $12^{\circ} 7' 41''$. *a* 6, pale white; *b* 10, deep blue; dist. $59''\cdot 8$. A wide double star, on the Eagle's back. $\frac{1}{3}$ the distance on the line from ζ to *a*.

43 and 44 P. XX.—20h. 7m. 32s., N. $6^{\circ} 10' 28''$. *a* and *b* both $8\frac{1}{2}$, and both clear white; dist. $44''$. A double star, on the Eagle's beak. $4\frac{1}{2}^{\circ}$ f. β , nearly on the parallel of R. A.

56.—19h. 46m. 48s., S. $8^{\circ} 5' 24''$. *a* 6, blue; *b* 6, pale yellow; dist. $43''$. A wide and delicate object. Strangely hooked in with Aquila, though in the southern part of Antinous. A line from Altair through the variable star η Aquilæ, and 1° more than as far again, will find it. (η Aquilæ variable: maximum, 3 days; minimum, 5 days; period, 7 days, and is found $7\frac{1}{2}^{\circ}$ due s. of Altair, nearly on the equator.)

57.—19h. 47m. 19s., S. $8^{\circ} 34' 35''$. *a* $6\frac{1}{2}$, *b* 7, both blue; dist. $35''$. A fine double star, closely north of 56, the last object.

144 P. XIX.—19h. 23m. 24s., N. $2^{\circ} 37' 38''$. *a* 7, deep yellow; *b* 11, pale green; dist. $37''$. A delicate object, about 1° f. δ , on the parallel, a little s.

241 P. XIX.—19h. 36m. 14s., N. $8^{\circ} 3' 52''$. *a* $7\frac{1}{2}$, pale topaz; *b* $9\frac{1}{2}$, lilac; dist. $27''$. Nearly midway between Altair and μ 38, which is at the root of the Eagle's southern pinion.

220 P. XIX.—19h. 37m. 46s., N. $12^{\circ} 3' 13''$. *a* $8\frac{1}{2}$, white; *b* 14, blue; dist. $20''$. A very delicate double star, nearly 2° north of γ .

257 P. XIX.—19h. 38m. 32s., N. $10^{\circ} 27' 2''$. *a* 8, white; *b* 10, smalt-blue; dist. $4''$. On the back of the Eagle, and closely preceding γ .

263 P. XVIII.—18h. 53m. 48s., N. $14^{\circ} 43' 36''$. *a* $8\frac{1}{2}$, pale yellow; *b* $10\frac{1}{2}$, sapphire-blue; dist. $6''\cdot 5$. A fine double star, on the Eagle's tail. A good test object for a moderate telescope. Closely following ϵ , which is a rich yellow star, 3rd magnitude.

302 P. XVIII.—18h. 59m. 12s., N. $6^{\circ} 20' 53''$. *a* $7\frac{1}{2}$, lucid white; *b* 9, cerulean blue; dist. $10''\cdot 3$. $7\frac{1}{2}^{\circ}$ s. of ζ , on the same parallel of declination, just $\frac{1}{3}$ the distance on a line from ζ to λ Antin.

307 P. XIX.—19h. 45m. 49s., N. $9^{\circ} 57' 53''$. α 7, bright white; δ 13, blue; dist. 15". A very delicate double star, on the Eagle's neck. $1\frac{1}{2}^{\circ}$ n. of Altair closely f. 0.54.

ARGO NAVIS,

In the southern hemisphere, embracing a very condensed portion of the *Via Lactea*,—contains 64 stars (Flamsteed), one of the first magnitude (Canopus); six of the second; ten of the third; and twelve of the fourth. Only a few stars in the prow of the ship, and over it, under the haunches of Monoceros, are visible to the naked eye, in the latitude of London. They rise in January and set in April, and may be seen to the east of Sirius. Argo has been divided by astronomers into the hull, the keel, the stern, and the sail. Canopus is on the keel, as is also η Argûs. The poop and compass, with their immediate neighbourhoods, are the only portions that can be observed in Great Britain. The poop is marked by the star ι Turies, and is easily found, as it follows the group in Canis Major, which is south of Sirius. Canopus, the lucida of Argo, ranks next to Sirius in lustre, and is invisible to all parts of higher latitude than the southern coasts of Europe. Humboldt calls the constellation of the Ship, "The glory of the southern heavens." Admiral Smyth observes, that "its stellar riches seem to be inexhaustible." Sir Thomas Brisbane registered 1,330 stars in the constellation.

η Argûs is perhaps the most wonderful of all the stars in the heavens, situated in the centre of a nebula so vast, as to be a rival of the great nebula in Orion. Sir John Herschel found η variable, increasing to such an intensity of brightness (2nd Jan. 1838), that it surpassed all other stars of the first magnitude, except Canopus and Sirius. In April, 1843—according to the observations of Mackay, at Calcutta, and of Maclear, at the Cape of Good Hope, η Argûs became brighter than Canopus, and even almost equal to Sirius; and in February, 1850, Lieutenant Gillis observed it on the coast of Chili. " η Argûs, with its yellowish red light, which is darker than that of Mars, now comes next to Canopus in brightness, and is brighter than the united light of α Centauri." What increases so much the interest, and the mystery, also, of this star, is, that it has been recently discovered that the great nebula in which it is situated is variable also. In the centre of the nebula is a blank chasm, somewhat the shape of an hour-glass. The lower lobe of this curious figure has considerably enlarged since it was first observed by Sir John Herschel. The nebula extends over a surface of $7'$ in R. A., and $68'$ in Declination; the entire area occupies a space about five times the disc of the moon. Stars are projected upon it by thousands. H. counted 1,200 on a portion measuring $28'$ in Dec., and $32'$ in R. A., and he concluded that in looking at it we see through and beyond the Milky Way, far out into a starless region, disconnected altogether with our system. "It is not easy," he observes, "for language to convey a full impression of the beauty and sublimity of the spectacle which this nebula offers, as it enters the field of view of the telescope, ushered in as it is by so glorious and innumerable a procession of stars, to which it forms a sort of climax." At London, in lat. $51^{\circ} 30'$, a zone of 38° of the southern heavens, below the equinoctial, is visible above the horizon; and at the Cape of Good Hope a zone of 56° of the northern sky is within the range of vision.

Nebula.

64 H. IV.—7h. 35m. 55s., S. $17^{\circ} 53' 33''$. A bright planet-like nebula: pale bluish colour. $12''$ or $15''$ in diameter. Over the poop of the ship; on the parallel with β Canis Majoris. It forms one angle of an equilateral triangle with Sirius and ϵ Canis Majoris. 3° s. of the great cluster 46 M., in a gorgeously rich neighbourhood.

Clusters.

11 H. VII.—8h. 4m. 20s., S. $12^{\circ} 27' 41''$. A large cluster of 10th mag. stars, with a close double star in the centre, and a bright yellow star of the 6th mag. to the s. f. In the space under the haunches of Monoceros, $11\frac{1}{2}^{\circ}$ n. of Tureis in Argo's poop, in the field of the telescope, with the star 19. An equilateral triangle, with its base-line joining Sirius and Procyon, would place the cluster with its apex closely preceding the star 19.

37 H. VI.—7h. 53m. 34s., S. $10^{\circ} 24' 26''$. A compressed cluster, 10 to 16 magnitude stars, some "next to invisible." The most compressed part $4'$ to $5'$ in diameter. In the preceding portion is a very minute double star. The cluster is situate in a rich neighbourhood, over Argo's poop, within 3° of the last object. A line from Wasat (δ Geminorum), carried just closely f. Procyon, and produced as far again, will find it. "37 H. VI." is wrongly applied to designate 35 M., the great cluster in Gemini, on the Globe Atlas.

38 H. VIII.—7h. 30m. 20s., S. $14^{\circ} 11' 28''$. A large brilliant group, visible to the naked eye, containing a fine double star. a $7\frac{1}{2}$, and b 8, both bright bluish-white; dist. $8''$. 3° preceding the star 4, and $\frac{1}{2}$ the distance from 4 to μ Canis Majoris.

46 H. VIII.—7h. 33m. 17s., S. $16^{\circ} 3' 34''$. A loose cluster of small stars 9 to 16 magnitude, over the ship's stern. $13\frac{1}{2}^{\circ}$ f. Sirius, a little n. of the parallel of R. A., 2° s. and 2° p. the double star 2 Argûs. $1\frac{1}{2}^{\circ}$ to the n. is a small faint cluster, 87 H. VIII., $\frac{1}{2}^{\circ}$ s. is 47 H. VIII., and $1\frac{1}{2}^{\circ}$ n. is the great cluster, the next object.

46 M.—7h. 35m. 39s., S. $14^{\circ} 30' 39''$. A superb cluster, visible to the naked eye. Stars of the 10th magnitude. Fills the whole field. Almost a rival of 34 H. VI. in Perseus, or 35 M. in Gemini. "Among the larger stars on the northern verge is an extremely faint planetary nebula, 39 H. IV., discovered by Messier in 1769. It is 464 of Sir John Herschel's catalogue, 1830."—Smyth. "I could not see a planetary nebula which it contains, and which in Lassell's 20-foot reflector is an astonishing and interesting object."—Webb. Mr. Younge's $9\frac{1}{2}$ -inch refractor, before noticed, shows the nebula in this cluster with a bright star on its surface, so very strikingly, that a much less aperture ought to bring it out. In the great reflector of Lord Rosse, this nebula assumes an annular shape, somewhat like 57 M. "464 H. annular nebula, at the edge of cluster 46 M., has two stars in it, a third star suspected in the brightest part. Sketched Dec. 22, 1848." 46 M. is designated 48 M. by mistake, on Malby's 36-inch Globe Atlas, and the nebula is numbered 460, instead of 464. 46 M. is found $1\frac{1}{2}^{\circ}$ p. the star 4.

93 M.—7h. 38m. 47s., N. $23^{\circ} 32' 33''$. A small cluster, in the galaxy; very bright, in a very rich field. $\frac{1}{2}$ the distance from the star Tureis to β Canis Majoris, $1\frac{1}{2}^{\circ}$ n. p. ξ , or 6° p. ι 15.

Double Stars.

ι 15 Tureis, R. A.—8h. 1m. 48s., N. D. $23^{\circ} 55' 0''$. a $3\frac{1}{2}$, pale yellow; b 10, greyish; dist. $3''\cdot 8$. A fine star, with a minute companion, on the summit of

the ship's poop; easily found. A line from β Eridani, a bright star, 3° *n. p.* Rigel, produced to Sirius, and as far again, will touch it.

2.—7h. 39m. 17s., S. $14^\circ 21' 46''$. *a* 7, silvery white; *b* $7\frac{1}{2}$, pale white; dist. 17". In the field with 4 (a 5th mag. star, pale yellow). One of the group under the haunches of Monoceros, 1° *f.* the great cluster 46 M. A line from β Canis Minoris, carried a little *s.* of γ Can. Min., and produced rather more than as far again, will find it.

5.—7h. 41m. 37s., S. $11^\circ 51' 50''$. *a* $7\frac{1}{2}$, pale yellow; *b* 9, light blue; dist. $3''\cdot 5$. A fine object. 2° *n.* of 4, nearly on the same parallel of declination.

46 M.—7h. 35m. 39s., S. $14^\circ 40' 39''$. *a* $8\frac{1}{2}$, *b* 11, both pale white; dist. 15". A delicate double star, in a grand cluster. (See above.)

72 and 74 P. VIII.—8h. 19m. 13s., S. $23^\circ 36' 32''$. *a* 6, red; *b* $9\frac{1}{2}$, green; dist. 45". A very beautiful double star, 4° *f.* Tureis, nearly on the same parallel of declination; a little *n.* In the field with the star 756. A line from ξ (Asmidiske), carried just south of Tureis, and produced as far again, will find it.

149 and 147 P. VII.—7h. 28m. 36s., S. $23^\circ 10' 48''$. *a* 6 and *b* 6, both topaz-tinted; dist. 10". A beautiful object, 4° , or $\frac{1}{2}$ the distance on the line from ξ to Sirius.

175 and 177 P. VII.—7h. 33m. 18s., S. $26^\circ 29' 45''$. *a* $6\frac{1}{2}$ and *b* $6\frac{1}{2}$, both topaz-yellow; dist. $9''\cdot 8$. Very similar to last object. In the field with κ , close to σ . 7° *f.* Wezen (δ Can. Maj.), nearly on the parallel of declination.

A R I E S

Constitutes the first sign of the Zodiac, in the northern hemisphere. The Zodiac is a zone or belt of the heavens, divided into twelve signs, each measuring 30° . The signs are named after the several constellations which it embraces. They are—Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricornus, Aquarius, and Pisces. When the Zodiac was first assumed, 3,000 years ago, the Sun then entered the first point of Aries on the 25th day of March, but owing to the precession of the Equinoxes, that point has retrogressed, and is now in the constellation of Pisces. In order to avoid confusion, the ancient signs are still continued in their position upon the globe or star-map, but the year really opens now with Pisces instead of Aries. The Summer Solstice is in Gemini instead of Capricorn. The constellation of Aries is easily recognized: the principal portion being distinguished by the three bright stars α , β , γ , which form an obtuse-angled triangle. The head of the Ram rises in July, the body culminates in November, and the fore-legs set in February. N. Andromeda and Triangulum, E. Taurus, S. Cetus, W. Pisces.

Nebula.

112 H. I.—R. A. 1h. 51m. 56s., N. D. $18^\circ 21' 0''$. A large round nebula with a bright centre, on the Ram's neck, 2° *f.* γ . It forms a small triangle with β and γ a little south.

Double Stars.

α 13 Hamel.—1h. 59m. 33s., N. $22^\circ 49' 28''$. *a* 3, yellow; *b* 11, purple; diff. in R. A., $19''\cdot 5$. A very delicate and difficult double star, on the Ram's face. "The large star is followed by three minute stars, of which *b* is the central."—Smyth. Loomis mentions a *comes* to α 11 mag., $30''$ dist. Mr. George Hunt

glimpsed a minute star close in the rays of α , 15th January, 1864, 4-inch aperture. A very close faint star s . of α , was observed on the 4th January, 1864, with Mr. Younge's $9\frac{1}{2}$ -inch aperture. Rev. Mr. Dawes states that the close *comes* to α Arietis is a typographical error for ϵ Arietis, in Smyth's "CYCLE." Hamel forms an obtuse-angled triangle with α Trianguli and β Arietis.

β 6 Sheratan.—1h. 47m. 11s., N. $20^\circ 8' 52''$. a 3, pearly white; b 11, dusky; diff. in R. A., $7''\cdot 4$. On the right horn of Aries, $8\frac{1}{2}^\circ s$. of α Trianguli.

γ 5 Mesarthim.—1h. 46m. 6s., N. $18^\circ 38' 0''$. a $4\frac{1}{2}$, bright white; b 5, pale grey; dist. $8''\cdot 8$. A beautiful object. The first star discovered double by Dr. Hooke, in 1664. "I took notice that it consisted of two small stars very near together," on the lower band of the right horn, $2^\circ s$., a little p . β . γ has been called the first star in Aries, because it was once the nearest star to the equinoctial point, which was formerly in Aries, but is now in Pisces.

ϵ 48 Botein minor.—2h. 51m. 29s., N. $20^\circ 47' 57''$. a 5, pale yellow; b $6\frac{1}{2}$, whitish; dist. $0''\cdot 5$, 1835; $0''\cdot 9$, 1843. A very close double star, at the root of the Ram's tail; midway between Hamel and γ Tauri. "My 20 feet, power 480, has fairly separated it."—H. Smyth thinks it must be widening, for he easily separated the component stars. His later observations in the *Speculum Hartwellianum* confirmed the impression of orbital motion. "Struve considered this object the closest of all his double stars; the distance must have increased since his measures. He suspects both the components of variability, and Dawes confirms the idea."—Bishop.

λ 7.—1h. 50m. 25s., N. $22^\circ 56' 13''$. a $5\frac{1}{2}$, yellowish white; b 8, blue; dist. $36''\cdot 9$. A fine double star, at the root of the left horn, $2^\circ p$. a ., a little n . of the parallel. Pointed at by γ and β , at a little less than twice the distance between these stars.

π 42.—2h. 42m. 15s., N. $16^\circ 54' 11''$. a 5, pale yellow; b $8\frac{1}{2}$, flushed; c 11, dusky; dist. $a-b$, $3''\cdot 1$, $a-c$, $25''$. A triple star, on the haunch of Aries. "A superb trio."—Smyth. 10° due s . of δ 41 Muscæ, and on the same parallel of declin. A line from ζ Androm., carried just n . of Sheratan, and as far again, will find it.

ι 0.—1h. 55m. 59s., N. $25^\circ 17' 0''$. a $6\frac{1}{2}$, yellow; b $8\frac{1}{2}$, pale grey; dist. $2''\cdot 2$. A close double star. "A miniature of ϵ Bootis."—H. Over the Ram's head, in the group n . of α , a little f . the line from α Arietis to α Trianguli, $\frac{1}{3}$ the distance. It has several followers exactly on the parallel, and precedes the next object (14) by $1\frac{1}{2}^\circ$.

ι 4.—2h. 1m. 43s., N. $25^\circ 18' 0''$. a $5\frac{1}{2}$, white; b $10\frac{1}{2}$, blue; c 9, lilac; dist. $a-b$, $82''\cdot 6$, $a-c$, $106''\cdot 5$. A wide triple star, in the group over the head of Aries, towards the Triangle, $2\frac{1}{2}^\circ n$. of α , a little f .

σ 0 and ι 28 P. II.—2h. 29m. 9s., N. $24^\circ 3' 35''$. a 6, topaz-yellow; b 7, pale grey; dist. 38° . "The most southern of a fine group of double stars, scattered over Aries, Triangulum, and Musca, with extensive patches of blank space intervening."—Smyth. More than halfway from θ , in the nostril of Aries to the Fly.

σ 33.—2h. 52m. 46s., N. $26^\circ 28' 48''$. a 6, topaz; b 9, light blue; dist. $28''\cdot 5$. A fine object, closely preceding the small and nearly equilateral triangle of stars called the Fly, a little south.

δ 1.—2h. 42m. 1s., N. $26^\circ 42' 17''$. a 3, white; b 13, deep blue; c 11, livid; d 9, pale grey; dist. $a-b$, $15''$, $a-c$, $38''$, $a-d$, $124''$. A coarse quadruple star, one of the triangle of stars known as the Asterism of *Musca Borealis*, following Triangulum Minor. δ 41 Arietis is the lucida of the Fly, and easily found. A line from δ Andromedæ to α Trianguli, and produced as far again, will show it.

46 P. III.—3h. 15m. 32s., N. $20^{\circ} 29' 14''$. *a* 8, pearly white; *b* 9, yellow; dist. $0''\cdot 8$. A very close and extremely delicate double star, on the tail of Aries. On the line from δ Arietis (Botein Major) to the Pleiades, $\frac{1}{3}$ the distance.

52.—2h. 57m. 32s., N. $24^{\circ} 32' 42''$. *a* $6\frac{1}{2}$, bright white; *b* 7, pale blue; *c* 15, blue; *d* 13, lilac; dist. *a*—*b*, $0''\cdot 8$, *a*—*c*, $5''$, *a*—*d*, $105''$. A quadruple group, 4° s. f. 41 Arietis and 2° s. of the parallel of R. A. A line from γ Trianguli carried just n. of 41 Arietis (in the Fly), and half as far again, will find it.

96 P. II.—2h. 22m. 55s., N. $24^{\circ} 38' 12''$. *a* $6\frac{1}{2}$, pearly white; *b* 14, blue; dist. $12''\cdot 5$. A fine object, very difficult, just midway between Hamel and the Fly.

179 P. I.—1h. 42m. 41s., N. $21^{\circ} 26' 40''$. *a* 6, topaz-yellow; *b* 15, deep blue; dist. $2''\cdot 4$. $1\frac{1}{2}^{\circ}$ n. and a little p. β , on the line towards β Andromedæ.

222 P. I.—1h. 51m. 65s., N. $20^{\circ} 23' 5''$. *a* 6, topaz-yellow; *b* 15, deep blue; *c* 10, lilac; *d* 9, pale blue; dist. *a*—*b*, $2''\cdot 5$, *a*—*c*, $40''$, *a*—*d*, $165''$. A difficult quadruple star, a fine test object for the telescope. Close to the Ram's eye, about 1° following Sheratan, nearly on the parallel of R. A., a little n.

AURIGA.

A fine constellation, very rich in clusters and double stars, intersected by the Milky-Way. Its leader, Capella, is considered by some observers a rival of Vega, and is supposed to have changed in colour. The ancients pronounced it red; it is now decidedly white, with a pale yellow glare. Auriga embraces 66 stars (Flamsteed). A large portion of the constellation is always above the horizon of Great Britain. The head of the Charioteer passes vertically over England and Ireland. The constellation culminates in January. The legs of Auriga rise in August and set in May. Easily recognized by a triangle of stars α , β , and δ ; from the angle at α hang the two stars ζ and η . N. Camelopardus, E. Lynx, S. Orion and Taurus, W. Perseus.

Nebulæ.

217 H. I., 315 H.—R. A. 4h. 21m. 20s., N. D. $34^{\circ} 58' 26''$. A round pale nebula, between the legs of Perseus and Auriga; seen by H. in full moonlight, "enclosed within six stars, two of which point across its centre to a third star." As figured by Lord Rosse, a large nebula of enormous dimensions, with a rift or channel through the upper portion, intersected at right angles by another but fainter rift. The form is that of a large cone, somewhat resembling a windmill, with transverse blades extending from its apex. A line from β Tauri (Nath.), carried just s. of Aurigæ, and produced nearly as far again in the same direction, will find it. This nebula is marked in Perseus by mistake on the Globe Atlas. The maps S. D. U. K. place a 217 H. I. in both Perseus and Auriga, and within 1° of each other!

261 H. I., 355 H.—5h. 22m. 31s., N. $34^{\circ} 8' 20''$. A nebula enveloping what appears to be a triple star like an atmosphere, a most singular object; closely f. ϕ , and p. 36 M. by 1° — 2° n. of χ . Not marked on the Globe Atlas or Maps, S. D. U. K.

Clusters.

33 H. VII., 350 H.—5h. 10m. 46s., N. $39^{\circ} 12' 2''$. A fine field of small stars, on the loins of the Waggoner, containing a triplet of 10th magnitude stars, and a

very delicate double star in a group (see Double Stars.) "A pretty compressed cluster with one large star, the rest nearly of a size."—H. 1° s. f. λ (15). λ is $\frac{1}{3}$ the distance from Capella to β Tauri, $\frac{1}{3}$ from the pair ζ , η to θ .

36 M.—5h. 27m. 23s., N. $34^{\circ} 3' 9''$. A star-shaped cluster, 14th magnitude stars, arranged regularly "like the device of a star whose rays are formed of small stars."—Smyth. 2° f. ϕ , on the parallel of R. A. Marked 56 M. by mistake on the Globe Atlas, and also on the Maps S. D. U. K. 56 M. is the nebula between β Cygni and γ Lyræ.

37 M.—5h. 43m. 23s., N. $32^{\circ} 30' 46''$. A large and remarkably fine cluster. "Resolvable into stars, fills $1\frac{1}{2}$ field of the telescope, the stragglers extend very far; there may be 500 stars."—H. "A magnificent object, the whole field being strewn as it were with sparkling gold-dust, and the group resolvable into about 500 stars, from the 10th to the 14th magnitude, besides the outliers."—Smyth. It contains a double star (see Double Stars). 37 M. is easily found. A line from β Tauri on the ankle of Auriga, to the star 26, which is 3° n. f. and produced just as far again, will find it, or, a line carried over the four stars in the feet of the Twins, from ξ 1 and ξ 2 to μ (Tejat Post), and produced 2° more than as far again in the same direction, will place it in the field.

38 M.—5h. 20m. 21s., N. $35^{\circ} 46' 24''$. A beautiful cluster of small stars. "An oblique cross, with a pair of large stars in each arm, and a conspicuous single one in the centre."—Smyth. There is a very rich low-power field embracing some fine pairs, easily found, 2° n. of the star ϕ 24.

39 H. VII.—5h. 18m. 58s., N. $35^{\circ} 11' 50''$. A condensed cluster, 10 to 14 magnitude stars, in a gorgeous neighbourhood. A minute double star announces the cluster (see Double Stars). 1° s. of the last object 38 M., and 1° n. of ϕ 24, which is also the pointer to 261 H.

61 H. VIII.—4h. 58m. 52s., N. $37^{\circ} 30' 40''$. A loose cluster, 8 to 13 magnitude, having "four bright stars in a curve, of which the leader is double, and there are three other pairs."—Smyth. A little to the n. is a beautiful double star marked in Struve's catalogue 644. $\frac{1}{3}$ from ζ Aurigæ to β Tauri. ζ Aurigæ is one of the wide pair that hangs from Capella.

Double Stars.

α 13 Capella.—5h. 6m. 43s., N. $45^{\circ} 51' 41''$ α 1, bright white, with a yellowish tinge; b 12, pale blue; c 9, grey; dist. $a-b$, $165''$; $a-c$, $450''$. A splendid star with two very distant companions. "I have a strong impression that Capella has, within my recollection, increased in brightness, and M. Struve is of the same opinion."—H. According to Bessel, the light from Capella takes 70 years to reach the earth. α , β , and δ form a nearly right-angled triangle.

β 34.—5h. 49m. 38s., N. $44^{\circ} 55' 44''$. α 2, lucid-yellow; b $10\frac{1}{2}$, bluish; dist. $185''$. A fine star with a very distant companion, on the left shoulder of Auriga. The bright star about 10° f. Capella, 1° s. of the parallel of R. A. β , is at the right-angle of the triangle of α , β , δ .

θ 37.—5h. 50m. 30s., N. $37^{\circ} 12' 6''$. α 4, brilliant lilac; b 10, pale yellow; dist. $30''$. A neat double star, on the left wrist of the Waggoner, 8° s. of β . Pointed at by δ and β .

λ 15.—5h. 9m. 20s., N. $18^{\circ} 17' 10''$. α 5, pale yellow; b $9\frac{1}{2}$, plum-colour; dist. $102''$. On the right hand of the Waggoner, 6° due s. of Capella.

ν 32.—5h. 42m. 8s., N. $39^{\circ} 6' 18''$. α 5, rich yellow; b 12, dusky red; dist. $85''$. A wide double star on the left knee, lettered ν on the Globe Atlas; 31 is

also lettered *v*. On Malby's last globe (18-inch, 1858), the mistake is on the other side, for both stars are lettered *v*. One of a wide pair to the naked eye, on the line from Capella to θ , closely *f*. τ 29, and 2° *n* of *v* 31.

" ϕ 24.—5h. 18m. 43s., N. $34^\circ 21' 27''$. *a* 5, *n*. of β Tauri, in a superb region."—Webb. One of a chain of seven nearly equidistant stars which hang upon Capella, and an important pointer to several fine objects in the neighbourhood. " ω 4.—4h. 50m. 5s., N. $27^\circ 41' 4''$. *a* 5, pale red; *b* 9, light blue; dist. $7''$. A fine object. "The star *n. f.* this object is 5 Aurigæ, and has been discovered to be a most delicate double star by Professor Struve; components 6 and 10 mag., $1\frac{1}{2}''$ apart."—Smyth. 5 is on the line from the star ω 4 to ζ . ω 4 is 5° *n*. of ϵ 3, which is not lettered on the Globe Atlas, nor on the Maps S. D. U. K.

14.—5h. 6m. 36s., N. $32^\circ 31' 47''$. *a* 5, pale yellow; *b* $7\frac{1}{2}$, orange; *c* 12, peculiar deep purple tinge; dist. *a—b*, $14''$, *a—c*, $15''$. A fine triple star in the group on the Waggoner's left knee. One of the stars in the group to the naked eye about $\frac{1}{3}$ the distance from β Tauri, towards the wide pair η , ζ .

26.—5h. 29m. 57s., N. $30^\circ 24' 33''$. *a* 5, pale white; *b* 8, violet ("a yellow, *b* blue or purplish"—Bishop); dist. $12''\cdot 6$. A fine double star, below the left knee of Auriga, 3° *n. f.* β Tauri.

33 H. VII.—5h. 10m. 46s., N. $39^\circ 12' 2''$. *a* $7\frac{1}{2}$, pale white; *b* 13, dusky; dist. $25''$. A very delicate double star in the cluster, 1° *s.* of λ (see Clusters).

37 M.—5h. 43m. 23s., N. $32^\circ 30' 46''$. *a* and *b* both 10, and both pale yellow; dist. $25''$. A fine double star in a cluster, immediately preceded on the parallel by another small double star, pointed at by β Tauri and 26 (see Clusters).

41.—6h. 1m. 16s., N. $48^\circ 44' 7''$. *a* 7, silvery white; *b* $7\frac{1}{2}$, pale violet; dist. $8''\cdot 2$. A neat double star. A line from β to δ precedes it by 2° , at 1° less than half-way, 3° *f.* ψ 46, a little *s.* 46 is not lettered on the maps S. D. U. K.

56.—6h. 37m. 0s., N. $43^\circ 42' 25''$. *a* 6, silvery white; *b* $8\frac{1}{2}$, lilac; dist. $56''\cdot 8$. A wide double star on the left foreleg of the Lynx. "This is an object which, though belonging to Auriga, is on the Telescopium Herschelii, an Asterism proposed by the Abbé Hell to commemorate the discovery of the planet Uranus, in this spot, March 13, 1781."—Smyth. A line from *a* over β , and produced as far again, will find it.

59.—6h. 44m. 33s., N. $39^\circ 4' 43''$. *a* 6, pale yellow; *b* 11, livid; dist. $22''$. A delicate double star, between the left arm of Auriga and the Lynx. The northernmost of a group of three stars, 5° *n.* of θ Geminorum, which is on the right hand of Castor.

61 VIII.—4h. 58m. 52s., N. $37^\circ 10' 40''$. *a* 7, topaz; *b* 8, amethyst; dist. $1''\cdot 8$. A close double star in a loose cluster, 2° *s.* of μ , and 9° *s.* of *a*.

225 P. V.—5h. 41m. 8s., N. $31^\circ 48' 27''$. *a*, creamy white; *b* $8\frac{1}{2}$, pale yellow; dist. $3''\cdot 8$. A beautiful double star. A line from β Tauri just *s.* of the star 26, and produced nearly as far again, will touch it, 1° *s.* *p.* 37 M.

BOOTES.

An extensive and highly interesting constellation, easily distinguished by continuing the curved line of the Greater Bear's tail, touching γ and ϵ Bootis, until it strikes Arcturus. The head and left arm of the Herdsman never set to London. The lower parts rise in January, culminate in May, and set in August. Bootes comprises 54 stars (Flamsteed), of which about 30 are double, but are not all accessible to moderate telescopes. N. Draco; E. Hercules, Corona Borealis, and Serpens; S. Virgo; W. Canes Venatici and Coma Berenices.

Nebulæ.

99 H. I.—R. A. 14h. 12m. 47s., N. D. $30^{\circ} 7' 24''$. A pale round nebula, bright in the centre, preceding the right arm-pit of Bootes. A line from the star β carried 1° south of γ , and half as far again, will find it where it lies, 1° n. f. the star 16.

101 M.—13h. 58m. 24s., N. $55^{\circ} 1' 1''$. "A pale white nebula in a nebulous field."—Smyth. "Sketched three times, large spiral, faintish, several arms and knots, $14'$ across at least."—Lord Rosse's observations. See figure in Philosoph. Trans. 1862. An object of still more wonderful construction than even 51 Messier. How it can constitute a separate system or universe having one centre, is most bewildering to the imagination. Several telescopic stars in the field, one of which is close to the nebula, lie in a blank region to the naked eye. The position of 101 M. is easily found by star-pointers. It forms an equilateral triangle with Alkaid and Mizar (the last two stars in greater Bear's tail), or a line from α Draconis (Thuban), carried on the parallel of declination due south 10° will place it in the field. Strange that two such extraordinary objects as 51 M. and 101 M. should lie so closely together, but 31 M. and 51 M. are a like instance.

756 H. II.—14h. 54m. 17s., N. $54^{\circ} 26' 30''$. A small white nebula with a bright nucleus preceding a fine wide double star; in the northern section of Bootes, sometimes designated "*Quadrans Muralis*," but frequently included on the globes with Draco. "A streak through this nebula suspected."—Lord Rosse's observations. A line from Alkaid, just to the north of the group ι and θ Bootis, and produced nearly as far again (about 5°), will find it.

759 H. II.—15h. 11m. 19s., N. $56^{\circ} 48' 42''$. A long pale nebula, which, though classed with Bootes, is really on the belly of Draco. "A superb ray nebula."—H. "Looks like a faint streak."—Smyth. $\frac{2}{3}$ the distance from θ Draconis to θ Bootis. The three nebulae, 22 Messier, 219 H. and 759 H. II., hang upon the star ι Draconis.

Double Stars.

α 16 Arcturus.—14h. 9m. 32s., N. $19^{\circ} 53' 49''$. a 1, reddish yellow; b 11, lilac; difference in R. A., $15''.1$. A splendid star, with a distant companion, between the legs of Bootes. Astronomical observers are not agreed concerning the precise colour and the brilliancy of this star, but it is generally acknowledged to be the leader of the heavenly host in the northern hemisphere. "Arcturus is suspected of variability; Mr. Fletcher has noted it as alternately brighter and less bright than Capella."—Smyth. Its parallax is too small to be estimated, and its distance must therefore be enormous. A continuation of the curve of the Bear's tail will point out Arcturus.

β 42 Nekar.—14h. 56m. 51s., N. $40^{\circ} 55' 30'$. a 3, golden yellow; b 11, pale grey; dist. $593''$. A fine star, with a very distant minute attendant, on the right cheek-bone of Bootes. " β , γ , δ , and μ , form the trapezium which the Arabian astronomers called the Hyæna."—Smyth. A line from δ Ursæ M., to η Ursæ M., and produced as far again, will strike β Bootis.

δ 49.—15h. 10m. 3s., N. $33^{\circ} 49' 14''$. a $3\frac{1}{2}$, pale yellow; b $8\frac{1}{2}$, light blue; dist. $110''$. On the left shoulder of Bootes; a line from Arcturus carried closely south of ϵ , and nearly the same distance beyond, will strike it.

ϵ 36 Izar.—14h. 39m. 5s., N. $27^{\circ} 38' 40''$. a 3, pale orange; b 7, sea-green; dist. $2''.8$. This beautiful star is the Pulcherrima of Professor Struve, a suspected

binary. An exceedingly difficult object, from the brightness of the principal star, the oblique position and peculiar colour of the companion, the Rev. Mr. Webb has separated it with $2\frac{1}{4}$ -inch aperture, 28-inch focus. The large star was once reported double, but this has met a decided negative from the fine eye of the Rev. Mr. Dawes. ϵ is the next star in the curve of stars from Arcturus to Ursa Major, and forms the apex of a triangle with α and ξ . ϵ is called Mirach on the Globe Atlas. There are three stars so called, to the great confusion of the amateur observer: β Andromedæ, β Ursæ Majoris, and ϵ Bootis. The proper name of the last star is Izar.

ζ 30.—14h. 34m. 42s., N. $14^{\circ} 18' 34''$. a $3\frac{1}{2}$, bright white; b $4\frac{1}{2}$, bluish white, and supposed variable; dist. $1''$. A fine and very close double star, on the left ankle of Bootes; the lowest of the three bright stars following Arcturus. ζ is considered a good test-object for the telescope. "It is probably owing to a combination of extreme closeness with obliquity of position, that the measures of this difficult star are so unsatisfactory."—Dawes.

η 8 Muphris.—13h. 48m. 15s., N. $19^{\circ} 4' 33''$. a $3\frac{1}{2}$, pale yellow; b $10\frac{1}{2}$, pale lilac; dist. $123''\cdot 7$. Under the right knee of Bootes, 5° p. Arcturus, and 1° s. of the parallel of R. A.

ι 21.—14h. 11m. 23s., N. $52^{\circ} 0' 22''$. a and b $4\frac{1}{2}$, pale yellow; c 8, creamy white; dist. $a-b$, $0''\cdot 5$; $a-c$, $37''\cdot 9$. A singularly delicate triple star. Professor Struve first detected the duplicity of a . At the northern part of the constellation, one of a wide triplet of stars forming an isosceles triangle with Mizar and Alkaid in Ursa Major, with the apex at Mizar. The group is pointed at by a line from δ , ϵ , and ζ , Ursæ Majoris.

κ 17.—14h. 8m. 38s., N. $52^{\circ} 25' 25''$. a $5\frac{1}{2}$, pale white; b 8, bluish; dist. $13''$. In the right hand of Bootes, one of the group last-mentioned, closely n . preceding ι .

μ^1 51 Alkalurops.—15h. 19m. 24s., N. $37^{\circ} 51' 5''$. a 4, flushed white; b 8 and c $8\frac{1}{2}$, both greenish white; dist. $a-b$, $109''$, $b-c$, $1''\cdot 3$. A triple star, on the upper part of the staff or club of Bootes; one of the trapezium of stars (β , γ , δ , and μ), called the Hyæna. It forms the $s. f.$ apex of a nearly equilateral triangle with β Bootis and the group ν^1 and ν^2 , on the upper part of the Herdsman's staff.

μ^2 74 P. XV.—15h. 19m. 25s., N. $37^{\circ} 49' 18''$. a 8 and b $8\frac{1}{2}$, both greenish white; dist. $0''\cdot 8$ ($1''$ Dawes). This object constitutes the 2nd and 3rd components of μ^1 . There is much difference in the estimation of distance by various observers. Binary, "period about 460 years."—Smyth. A highly-interesting object. There is another star μ usually placed on the top of the staff of Bootes, but it is properly 6 Coronæ Bor.

ξ 37.—14h. 45m. 9s., N. $19^{\circ} 39' 48''$. a $3\frac{1}{2}$, orange; b $6\frac{1}{2}$, purple; dist. $6''\cdot 5$. A binary star of great interest. The colours in fine contrast. Period as computed by H., 117 years, perihelion passage 1779. Very difficult, "sharp small discs with 500."—H. 9° f. Arcturus, nearly on the parallel of R. A.

π 29.—14h. 34m. 22s., N. $16^{\circ} 59' 57''$. a $3\frac{1}{2}$, b 6, both white; dist. $6''$. Suspected binary. The central star of three, which form a curve. On the left leg of Bootes. $6\frac{1}{2}^{\circ}$ f. a , and 3° s. of the parallel of R. A.

ι 1.—13h. 34m. 13s., N. $20^{\circ} 38' 20''$. a 6, sapphire blue; b 10, smalt blue; dist. $4''\cdot 9$. A beautiful double star: there are two other stars in the field of the same colour, $8\frac{1}{2}^{\circ}$ p. a . A line from ξ over a , and as far again, will shew it.

ρ 39.—14h. 45m. 7s., N. $49^{\circ} 15' 20''$. a $5\frac{1}{2}$, white; b $6\frac{1}{2}$, lilac; dist. $3''\cdot 8$. A fine object, over the head of Bootes, within 2° of the next object. A line from Mizar, the second star on the Bear's tail, carried just n . of ι Bootis, and produced 1° less than as far again, will find it.

44.—14h. 59m. 21s., N. $48^{\circ} 10' 51''$. a 5, pale white; b 6, lucid grey; dist. $3''.7$. A very beautiful and interesting binary star, a miniature of Castor, period not yet ascertained; close to 39. A line from Mizar through the group in the right-hand of Bootes, and produced as far again, will touch it.

69 P. XIV.—14h. 16m. 45s., N. $9^{\circ} 2' 46''$. a 6, flushed white; b $7\frac{1}{2}$, smalt blue; dist. $6''.3$. A neat double star, on the asterism of *Mons. Mænalus*, between the left foot of Bootes and Virgo. Not marked on Malby's Globe or Globe Atlas; 69 is close to Hevelius' star 18. A line from ξ carried just $p.$ ζ , and produced as far again, will find 18. Midway between ζ Bootis and τ Virginis.

220 and 219 P. XIII.—13h. 44m. 2s., N. $21^{\circ} 56' 53''$. a $7\frac{1}{2}$, and b 8, both flushed white; dist. $86''$. This star precedes the right shin of Bootes, closely $f.$ the star 6. A line from π carried a little $s.$ of Arcturus, and less than as far again, will find it.

279 P. XIV.—15h. 1m. 1s., N. $9^{\circ} 44' 41''$. a and b both $7\frac{1}{2}$, and both pale white; dist. $4''$. A fine object. A line from Arcturus carried 1° $n.$ of ζ , and produced rather more than as far again, will shew it.

CAMELOPARDUS.

A very extensive region of the north polar heavens, with very few stars visible to the naked eye, rather barren in telescopic objects, consists of 58 stars (Flamsteed), none larger than the fourth magnitude; never sets in the latitude of London; reaches from Auriga to the Pole, and embraces all the polar regions except those parts assigned to Ursa Minor, Draco, and Cepheus. E. Ursa Major; S. Lynx and Auriga; W. Cassiopea and Cepheus.

Nebulæ.

53 H. IV.—R. A. 3h. 55m. 36s., N. D. $60^{\circ} 27' 52''$. A bright nebula of a bluish tint, about $60''$ in diameter, "light uniform and definition abrupt."—H. A line from η Persei to the star 3 Camelopardi, and less than as far again, will find it.

47 H. VII.—"Closely following the north vertical of the last object, and about half a degree from it, is a beautiful and brilliant field of stars; many of the components are in pairs, the brightest of which is a neat double star, both 7 mag., and decidedly red."—Smyth. $1\frac{1}{2}^{\circ}$ to the $n.$ of 53 H. IV., and on the same parallel of declination.

Double Stars.

1.—9h. 21m. 21s., N. $53^{\circ} 36' 50''$. a $7\frac{1}{2}$, white; b $8\frac{1}{2}$, sapphire blue; dist. $10''$. A neat double star between the hind legs of the Camelopard. Less than midway between α Persei and δ Aurigæ.

2.—4h. 29m. 16s., N. $53^{\circ} 12' 17''$. a $5\frac{1}{2}$, yellow; b $7\frac{1}{2}$, pale blue; dist. $1''.7$. A close double star, "an exquisite object."—Smyth. In the group embracing the double stars 1 and 7.

7.—4h. 46m. 27s., N. $53^{\circ} 32' 0''$. a 5, white; b 13, orange; dist. $27''$. A delicate and difficult object. On the line from δ Aurigæ to α Persei, rather more than $\frac{1}{4}$ the distance.

35.—5h. 33m. 46s., N. $51^{\circ} 34' 30''$. a 7, white; b 10, lilac; dist. $30''$. A double star, strangely classed in the Camelopard, but situated in the Waggoner's eye. More than $\frac{1}{4}$ from δ Aur. to β Aurigæ.

97 P. III.—3h. 31m. 36s., N. $59^{\circ} 31' 46''$. a 6, deep orange, almost scarlet; b 9, blue.—Webb. Midway between the stars 3 and 9 (Hevelius). A line from Algol carried just preceding Marphak and as far again, less five degrees, will find it.

159 P. VII.—7h. 33m. 0s., N. $65^{\circ} 28' 30''$. a 8, b 8, both white; dist. $16''$. A fine object, in a very rich neighbourhood. A line from θ Ursæ Majoris, over α Ur. Maj., and half as far again, will find it.

232 and 230 P. XII.—12h. 48m. 15s., N. $84^{\circ} 8' 50''$. a 6, and b $6\frac{1}{2}$, both bright white; dist. $21''\cdot 4$. A neat double star, $\frac{1}{2}$ the distance from Polaris to κ Draconis. A line from Polaris to δ Urs. Min. forms the base of a nearly isosceles triangle with its apex at 232, 7° distant. Not marked on Malby's Globe or Globe Atlas. Identical with 32 (Hevelius), on the Maps S. D. U. K.

269 P. IV.—5h. 0m. 21s., N. $79^{\circ} 4' 5''$. a $5\frac{1}{2}$ light yellow; b 9, pale blue; dist. $33''\cdot 8$. A fine double star. A line from δ Ursæ Minoris, carried a little π of Polaris, and two and a half times the distance beyond, will find it. Not marked on the Globe Atlas. Identical with 19 (Hevelius), on the Maps S. D. U. K.

C A N C E R .

A small constellation, distinguishable to the naked eye only by a few small stars and by the cluster called the Præsepe or "Beehive," which is seen as a dull patch of light, less than half way from the bright stars Castor and Pollux in Gemini, to Regulus in Leo. Cancer is one of the constellations of the Zodiac—consists of 83 stars; rises in September, culminates in February, and sets in May. N. Lynx; E. Leo; S. Hydra; W. Canis Minor and Gemini.

Clusters.

44 M.—R. A. 8h. 32m. 28s., N. D. $20^{\circ} 24' 36''$. The well-known cluster, the Præsepe, included by Messier in his celebrated list of 103 Nebulæ, published in 1769. The stars are larger than those of the Pleiades; Galileo counted 36. The arrangement of the stars in the cluster is very striking. It lies on the body of the Crab. A line from Regulus to Wasat (δ Geminorum) will pass just $s.$ of the Præsepe, at 2° more than midway—easily found by the naked eye.

67 M.—8h. 43m. 48s., N. $12^{\circ} 18' 10''$. A fine cluster, but coarse and scattered, composed of a large number of stars, 9th and 10th magnitude. H counted above 200 in the field at once,— $2^{\circ} p.$ a^2 (Sertan, 4 mag.), on the Crab's southern claw. On a line midway between Procyon and γ Leonis, or, a line from Procyon carried just $s.$ of β Cancr., and as far again, will find it.

Double Stars.

δ 47 Asell. Australis.—8h. 37m. 0s., N. $18^{\circ} 38' 50''$. a $4\frac{1}{2}$, straw colour; b 15, blue; dist. $25''$. A very delicate double star, one of the stars called Aselli by the Romans. " b is a mere glimpse object."—Smyth. $2^{\circ} s. f.$ the Præsepe, and on the line towards Sertan.

ϵ 38.—8h. 32m. 42s., N. $20^{\circ} 1' 55''$. a $6\frac{1}{2}$, b 7, both pale white; dist. $133''\cdot 6$. One of the stars in the Præsepe, the last following.

ζ 16 Tegmine.—8h. 4m. 23s., N. $11^{\circ} 3' 14''$. a 6, yellow; b 7, orange tinge; c $7\frac{1}{2}$, yellowish; dist. $a-b$, $1''\cdot 3$, $a-c$, $5''$. A close, delicate, and remarkably fine

triple star. The observations of Sir W. and Sir J. Herschel, of Admiral Smyth, and Rev. W. R. Dawes, on this star, are of great interest to astronomers. *c* has more than completed a whole revolution around *b* since first observed by H. "The two close stars perform a binary revolution in about 60 years, while the outer one accomplishes a grand orbital ellipse in about 500 years; the nearer companion seems to have a tenfold quicker motion than the more distant one."—Smyth. Mädler has computed the period of the close stars 58 years, and the perihelion passage A. D. 1816. "The two smaller stars, I find, are becoming much closer, as is proved by the following measures received by Mr. Younge from Mr. Talmage (one of Mr. Bishop's assistants at Twickenham)":—

ζ Cancr.	Angle.	Distance.
1853. 17.	322°. 7.	0''·90.
1860. 26.	281°. 0.	0''·70.
1863. 25.	262°. 5.	0''·67.

A line from Castor through Pollux, and $2\frac{1}{2}$ times the distance beyond, will place Tegmine in the field, on the line from Sirius over Procyon.

θ 31.—8h. 24m. 19s., N. 18° 33' 2''. *a* $5\frac{1}{2}$, yellow; *b* 9, grey; dist. 65''. A fine star with a distant companion, in the middle of the Crab's body. 3° *p.* δ , on the same parallel of R. A.

ι 48.—8h. 38m. 26s., N. 20° 15' 7''. *a* $5\frac{1}{2}$, pale orange; *b* 8, clear blue; dist. 30''. A beautiful double star, the colours in striking contrast. At the end of the Crab's northern claw. 1° *p.* the group $\rho^1, ^2, ^3$. 9° *n.* of the Præsepe and 1° *p.* A line from β carried between θ and η , and as far again, will find it.

σ^2 57.—8h. 46m. 0s., N. 31° 5' 22''. *a* $5\frac{1}{2}$, white; *b* 7, yellow; dist. 1''·4. A very close double star, a capital test-object for the eye and instrument. Over the Crab's northern claw. 2° *n.* of the group $\rho^1, ^2, ^3$. A line from μ Urs. Maj. carried over 40 Lyncis, and half as far again, will find it. There seems much confusion about the two groups $\sigma^1, ^2, ^3, ^4$, and $\rho^1, ^2, ^3$. Malby's Globe Atlas and also his last globe, 1858 (following Flamsteed), letter and number σ^2 as ι^2 57, and place σ^2 59 $2\frac{1}{2}$ ° *n.* in the upper group, viz., σ^1 51, σ^2 59, σ^3 64, and σ^4 66. The maps of the Society for the Diffusion of Useful Knowledge, rejecting this arrangement, which seems the most simple, make the lower group σ^1 46, σ^2 57. σ^3 61, and omit σ^4 altogether, which is made 66 of the upper group. The *Catalogue* of the *British Association*, together with the *Bedford Catalogue* of Admiral Smyth, affirm the latter arrangement of the Maps S. D. U. K. σ^2 57 is therefore identical with Flamsteed ι^2 57, and is No. 192 of Piazz's catalogue.

σ^4 66.—8h. 53m. 7s., N. 32° 47' 53''. *a* 6, lucid white; *b* 9, sky blue; dist. 4''·8. A close double star, *n. f.* the Crab's northern claw; the last of the group, 66 is Piazz's No. 226.

ϕ^1 22.—8h. 18m. 15s., N. 28° 20' 39''. *a* $6\frac{1}{2}$, pale white; *b* 11, lilac; dist. 120''. A star with a distant companion, 1° *n.* of ϕ^2 . On the parallel of R. A. with Pollux, 9° *f.*

ϕ^2 53.—8h. 18m. 37s., N. 27° 22' 31''. *a* 6, and *b* $6\frac{1}{2}$, both silvery white; dist. 4''·8. A close and beautiful double star, among the Crab's northern claws. 1° *s.* of ϕ^1 .

ν^1 24.—8h. 18m. 37s., N. 24° 37' 57''. *a* 7, pale white; *b* $7\frac{1}{2}$ greyish; dist. 5''·8. A fine double star. A line from δ through the Præsepe, and three times the distance beyond, will find it.

11.—8h. 0m. 34s., N. 27° 51' 56''. *a* 7, pale yellow; *b* 12, lilac; dist. 3''·2. A delicate double star, *f.* Pollux $5\frac{1}{2}$ °. A little *s.* of the parallel of R. A.

13 P. VIII.—8h. 6m. 9s., N. $11^{\circ} 15' 23''$. a $7\frac{1}{2}$, lucid white; b 12, pale grey; dist. $2''\cdot 5$. A close double star, $1\frac{1}{2}^{\circ}$ *n. p.* β , which is on the extremity of the first southern leg of the Crab.

44 M.—8h. 32m. 28s., N. $20^{\circ} 24' 36''$. a $6\frac{1}{2}$, and b $7\frac{1}{2}$, both white; dist. $150''$. A wide double star, on the body of the Crab. In the northern part of the Præsepe.

67 P. VIII.—8h. 18m. 40s., N. $8^{\circ} 0' 11''$. a 6, pearly white; b 13, violet; dist. $35''$. A very delicate but wide double star, on the Crab's hindmost southern leg. 3° *s. f.* β , midway from β to δ Hydræ.

118 P. VIII.—8h. 31m. 20s., N. $20^{\circ} 8' 53''$. a 8, b $8\frac{1}{2}$, both pale white; dist. $55''\cdot 8$. A wide object, closely *p.* the Beehive.

124 P. VIII.—8h. 32m. 5s., N. $20^{\circ} 1' 12''$. a 7, pale yellow; b $7\frac{1}{2}$, dusky; c $6\frac{1}{2}$, lucid white; dist. $a-b$, $45''$, $a-c$, $90''\cdot 5$. A coarse triple star, close to the last object, *s. p.* the Præsepe.

CANES VENATICI.

An extensive constellation, very difficult to recognize by the naked eye, under the tail of the Greater Bear. Poor in clusters and double stars, but possessing some magnificent nebular objects; never wholly sets to London. The southern Hound, *Chara*, marked by the lucida of the constellation, Cor Caroli, rises in November, culminates in April, and sets in September. N. Ursa Major, E. Bootes, S. Coma Berenices, W. Ursa Major.

Nebulæ.

3 M.—R. A. 13h. 35m. 54s., N. D. $29^{\circ} 2' 58''$. A first-class resolvable nebula. "A most superb object, not less than 1,000 stars, 11 magnitude and under; they run into a blaze in the centre, and form, as it were, radiating lines, and pointed projections from the mass with many stragglers, 6' in diameter."—H. Between the southern Hound and the right hip of Bootes, situated in a triangle of three small stars, nearly midway between Arcturus and Cor Caroli, $1\frac{1}{2}^{\circ}$ nearer to the former. The same distance on the line from Arcturus to Cor Caroli, that ξ Bootes is from Arcturus.

29 H. V.—12h. 18m., N. $34^{\circ} 30'$. "Two nebulæ running into one another, very large bi-central, extremely ill defined."—H. 7° due *n.* of the tresses of Coma Berenices, and 2° *f.* the star 2, a little *n.* of the parallel of R. A.

42 H. V.—12h. 34m. 54s., N. $33^{\circ} 29' 50''$. An enormously long nebula, extending across the whole field. "15' diam., nucleus not well defined, preceded by a star 10 mag., and that again by a faint regular nebula, forming a very curious combination. A most extraordinary object; masses of light appear through it in knots."—Observations of Lord Rosse. This object is 1397.—H. It lies midway between Cor Caroli and the group surrounding the lucida of Coma Berenices.

51 M.—13h. 24m. 9s., N. $47^{\circ} 53' 54''$. A bi-central nebula, discovered by Messier in 1772. One centre is considerably larger than the other, the smaller is the brighter of the two, but this may arise from the larger being apparently enveloped in a luminous atmosphere; both centres show stars by glimpses on their surface to a good 4-inch aperture refractor,—near the ear of Asterion. A line from ι Bootis over Alkaid, and produced as far again, less 1° , will find it.

51 M. is perhaps the most wonderful of all the spiral nebula discovered by the Earl of Rosse. "Observed 28 times before it was sketched; Herschel's ring not apparent, the centres clearly resolved; the spirality of the nuclei observed very plainly; the general appearance of the object as seen in the drawing, would have been better if the minute stars had been put in from the eye-sketch. The nebula itself is, however, pretty well studded with stars, which can be distinctly seen, of various sizes, and of a few of these, with reference to the principal nucleus, measures were taken."—Lord Rosse's *Observ. Phil. Trans.*, 1862. Fourteen spiral nebulae were discovered by Lord Rosse up to 1850, besides many others, in which indications of the same character were observed, but were marked "doubtful;" some of these have been affirmed in more recent observations, and many others added to the list. 51 M. appears to be the most conspicuous of the class. See *The London Review* (51 Messier), 18th October, 1862.

63 M.—13h. 9m. 45s., N. $42^{\circ} 45' 43''$. An oval nebula, brightens in the centre, nucleus resembling a small star, on the chest of Asterion (the northern Hound). "9' or 10' long, and near 4' broad, with a very brilliant nucleus." H. A line from Cor Caroli to Alkaid will just precede it at $1\frac{1}{2}^{\circ}$ less than one-third of the distance. $1\frac{1}{2}^{\circ}$ n. of the group 18, 19, 20.

94 M.—12h. 44m. 33s., N. $41^{\circ} 51' 30''$. A large bright nebula, comet-shaped, and showing symptoms of resolvability. 3° n. and 1° p. Cor Caroli.

95 H. I.—12h. 8m. 50s., N. $37^{\circ} 4' 27''$. A fine nebula, between the two hounds. Sir John Herschel discovered two nuclei in the nebula. 2° less than half way on a line from Cor Caroli to ξ Ursæ Majoris. 4° due s. of the star 2 6 mag., on the same parallel of declination, on the line to 2 Hevelius.

187 H. I.—13h. 50m. 55s., N. $47^{\circ} 54' 42''$. A small oval-shaped nebula, preceding the right arm of Bootes, 6° f. the nebula 51 M. A line from Mizar, carried just f. Alkaid, and produced $\frac{1}{3}$ the distance beyond, will find it.

Double Stars.

2.—12h. 9m. 22s., N. $41^{\circ} 24' 45''$. a 6, golden yellow; b 9, smalt blue; dist. $11''\cdot3$. A fine object near Chara's mouth, 6° n. of the scattered cluster in Coma Berenices. 1° more than $\frac{1}{3}$ of the distance to δ Leonis, f. ν Ursæ Majoris, by 1h. or 15° , on the parallel of R. A. This star is 2 Hevelius, $7\frac{1}{2}^{\circ}$ s. of 2 Flamsteed.

ξ Preceding 3 M.—13h. 32m. 54s., N. $29^{\circ} 2' 58''$. a $9\frac{1}{2}$, and b $10\frac{1}{2}$, both white; dist. $1''\cdot0$. No. 1663.—H. This "little beauty" was discovered by Admiral Smyth, at Slough, and is inserted as a high test of a six-inch achromatic refractor. "Observed with Capt. Smyth, who saw 'something remarkable' in a small star $2'$ or $3'$ p. the cluster, 3 M., which proved, on closer examination, to be a fine first-class double star."—H.

12 Cor Caroli.—12h. 49m. 43s., N. $39^{\circ} 2' 44''$. a $2\frac{1}{2}$ flushed white; b $6\frac{1}{2}$, pale lilac; dist. $20''$. The leader of the constellation, fine contrast of colours. Forms a right-angled triangle with Alioth and Alkaid, the right angle at Alkaid, $\frac{1}{3}$ the distance on a line from Alkaid to Deneb, in the Lion's tail.

8.—12h. 27m. 11s., N. $42^{\circ} 12' 3''$. a $4\frac{1}{2}$, pale yellow; b 10, bluish; dist. $297''$. A fine star, with a distant companion. a is described by H. as involved in a nebulous atmosphere, and is suspected of variability. On the mouth of Chara, $5\frac{1}{2}$ n. p. Cor Caroli, $\frac{1}{3}$ of the distance, on a line from Cor Caroli to χ Ursæ Majoris. A line from θ Bootis over Alkaid, and produced 2° more than twice as far, will reach it. The faint nebula, 1332 H., is in the field, and will probably account for the nebulous appearance of this star.

25.—13h. 31m. 12s., N. $37^{\circ} 46' 35''$. α 6, yellow; δ 8, blue; dist. $1''$. A close double star, discovered by Struve, in a blank neighbourhood, rather difficult to find. 12° *f.* Cor Caroli, and 1° *s.* of the parallel of R. A.

163 P. XIII.—13h. 34m. 25s., N. $28^{\circ} 44' 56''$. α $6\frac{1}{2}$, light orange; δ 13, ash-coloured; dist. $68''$. A delicate object, one of the outliers of the nebula 3 M. A line from ζ Bootis carried to a point 1° *f.* Arcturus, and rather more than as far again, will touch the star η , which follows the nebula 3 M. by 3° , and the object 163 will be found 1° *s.* $p.$ 3 M., or 3° *p.* 9.

CANIS MAJOR.

A small but highly interesting constellation in the southern hemisphere, consisting of 64 stars, including the dog-star Sirius, one of Orion's hounds. Canis Major rises in November, culminates in January, and sets in March. N. Monoceros, E. and S. Argo Navis, W. Lepus.

Clusters.

12 H. VII.—R. A. 7h. 11m. 43s., S. $15^{\circ} 23' 55''$. A tolerably compressed cluster, discovered by the indefatigable Miss Herschel, in 1785. Stars 10 mag., *f.* γ , which is a variable star, in the Dog's neck, by $3\frac{1}{4}^{\circ}$. $7\frac{1}{4}^{\circ}$ *f.* Sirius, 1° *s.* of the parallel of R. A.

14 H. VII.—6h. 53m. 19s., S. $13^{\circ} 31' 4''$. A cluster at the root of the Greater Dog's ear. Stars 8 to 11 magnitude, $20'$ in diameter. 1° *f.* μ , a little *s.* and 3° *n.* *f.* Sirius.

41 M.—6h. 40m. 59s., S. $20^{\circ} 36' 15''$. An extensive cluster, or rather a series of five clusters, of which the central one is the richest, on the Dog's chest. Discovered by Messier in 1764. "A mass of small stars," containing a double star (see below). "Direct the telescope, charged with a low power, upon Sirius, and then depressing it $4^{\circ} 5'$, when in about a minute a pair of 8th magnitudes will appear, 233 and 236 P. VI., and in about another minute the cluster will follow."—Smyth. Not marked on the Globe Atlas.

17 H. VII.—7h. 13m. 6s., S. $24^{\circ} 41' 35''$. A very beautiful cluster of minute stars, surrounding the double star 30, in a group on the Dog's back. At the northern vertex of a nearly equilateral triangle formed with the base line from η to ϵ .

Double Stars.

α 205 Sirius.—6h. 39m. 13s., S. $16^{\circ} 31' 28''$. α 1, bright white; δ 10, deep yellow; dist. $150''$. Sirius has no rival in splendour, and is the leader of the whole heavenly host. The interest of this star has vastly increased by the recent discoveries of Alvan Clark, of Boston, and of M. Goldschmidt, of Paris. The former with his 18-inch refractor has placed this great luminary of the starry firmament amongst the close double stars, and the latter has ranked it as a multiple star, having, (including Mr. Clark's) six companions, of which δ 10 of the Bedford catalogue is one of the most distant. Lassell, at Malta, determined the angle of position of Mr. Clark's close companion to be $83^{\circ} 35'$; dist. $4''\cdot92$; binary period, 50 years. M. H. Goldschmidt has informed the French Academy that he has been able to see Alvan Clark's companion to Sirius, at intervals, with a telescope of 46 lines aperture ($3\frac{1}{2}$ Eng. inches), and that he has also observed several other minute stars from $15''$ to $1'$ distance from Sirius. One of these,

which, he asserts, is without doubt a companion, is south of that discovered by Clark, angle of position, 95° — 97° . A seconds star on the line, between Alvan Clark's companion, was an almost imperceptible point of light east of Sirius and of *comes* No. 1. He finds another faint star, No. 3 D; and adds, the star No. 4 E has an angle of position of 170° , and No. 5 has an angle of 25° — 30° , and both are distant from Sirius in the proportion of No. 1. Since the discovery of close companions to Sirius and Antares, it has been conjectured that all the great stars are, not as hitherto supposed, reigning in solitary grandeur, but really double or multiple stars, associated with companions, and moving in orbits which may yield up the secrets of their curves and periods to the increased optical power of the present day. Sirius is said to have changed colour. "Seneca called it 'redder than Mars'; Ptolemy classed it with 'the ruddy Antares.' I now see it an intense white with a sapphire tinge, and an occasional flash of red."—Webb. Probably the changes of colour of the great stars may be owing to the revolution and position of their companions. Sirius with Procyon and Betelgeux form a magnificent equilateral triangle.

β 2 Mirzam.—6h. 16m. 46s., S. $17^{\circ} 53' 28''$. a $2\frac{1}{2}$, fine white; b 9, dusky grey; dist. $104''$. A fine star, with a distant companion, on the Dog's fore paw. $5\frac{1}{2}^{\circ}$ p. Sirius, about 1° s.

δ 25 Wezen.—7h. 2m. 54s., S. $26^{\circ} 10' 49''$. a $3\frac{1}{2}$, light yellow; b $7\frac{1}{2}$, pale white; dist. $165''$. At the northern vertex of a triangle of bright stars, on the Dog's loins.

ϵ 21 Adara.—6h. 53m. 19s., S. $28^{\circ} 47' 23''$. a $2\frac{1}{2}$, pale orange; b 7, violet; diff. in R. A. 24s. On the Dog's belly, forming a triangle with η and δ .

η 31 Aludra.—7h. 18m. 40s., S. $29^{\circ} 22' 26''$. a 3, pale red; b $7\frac{1}{2}$, dull grey; dist. $169''$. A fine star, with a distant companion, two small stars f . At the root of the Greater Dog's tail, $6\frac{1}{2}^{\circ}$ f. Adard, the southern apex of a triangle with δ and ϵ .

ζ 1 Phurud.—6h. 15m. 7s., S. $30^{\circ} 0' 25''$. a 3, light orange; b 7, pale grey; dist. $167''$. On the Dog's left hind paw. A line from Sirius through the pair of stars ξ^1 and ξ^2 , and rather more than as far again, will find it.

μ 18.—6h. 49m. 55s., S. $13^{\circ} 52' 16''$. a $5\frac{1}{2}$, topaz-yellow; b $9\frac{1}{2}$, grey; dist. $3''\cdot 5$. A fine double star, on the Dog's right ear, 3° n. f. Sirius, in a splendid neighbourhood.

ν^1 6.—6h. 30m. 28s., S. $18^{\circ} 33' 4''$. a $6\frac{1}{2}$, pale garnet; b 8, grey; dist. $17''\cdot 2$. A neat double star. The central star of the group on the Dog's left fore-knee, 3° s. p. Sirius, forming an obtuse-angled triangle with a and β .

π^2 17.—6h. 49m. 11s., S. $20^{\circ} 14' 8''$. a 6, flushed white; b $9\frac{1}{2}$, ruddy; c 10, ruddy; d 11, dusky; dist. $a-b$, $45''$, $a-c$, $52''\cdot 5$, $a-d$, $125''$. A coarse quadruple star, on the Dog's right shoulder-blade. One of a group π^1 , 2 , 3 , 2° f. the cluster 41 M., which is 4° s. of Sirius. Is not lettered on the maps S. D. U. K.

30.—7h. 13m. 6s., S. $24^{\circ} 41' 35''$. a $6\frac{1}{2}$, white; b 9, pale grey; dist. $85''$. A double star in the cluster 17 H. VII., on the Dog's back. The northern apex of an equilateral with ϵ and η .

CANIS MINOR.

A small asterism in the northern hemisphere, the lesser Dog of the hunter Orion, consisting of 14 stars; rises in October, E. by N. about 50 minutes

before Sirius, and sets in May. It is easily known by the bright star Procyon. N. Gemini; E. Hydra; S. and W. Monoceros.

Double Stars.

α 10 Procyon.—R. A. 7h. 32m. 15s., N. D. $5^{\circ} 34' 40''$. a $1\frac{1}{2}$, yellowish; b 8, orange-tinge; dist. $145''$. This fine star has recently become an object of great interest. Admiral Smyth's *comes* is $2\frac{1}{2}'$ distant, described by Rev. Mr. Webb as "a curious variable star." First seen double by Mr. F. Bird; stars 9.5 and 9.8. A small star preceding Procyon, a little to the *n.* was discovered by Mr. J. G. Barclay Leyton, in 1856. "In looking from time to time for Admiral Smyth's lost star between this little double and Procyon, I have always carefully shut out both by using a small field; the very faint point, at a large angle *n. p.* I estimated, of mag. 11.8. It is just steadily visible with my $8\frac{1}{4}$ -inch object-glass."—Rev. W. R. Dawes. Mr. Younge, of Sheffield, observed on the night of the 19th of April, 1864, a small blue star, 11th or 12th mag., close in the rays of Procyon, in the *south following quadrant*; so that it is probable Procyon may yet prove a rival of Sirius as regards companion stars. Bessel considers that in the proper motions of these splendid stars there is some mysterious analogy. "The movements of Procyon and Sirius, pointed out by Bessel, constrain the assumption that there are cases in which luminous bodies are satellites to dark masses."—Humboldt. Sirius, Procyon, and Betelgeux, form a splendid equilateral triangle.

β 3 Gomeisa.—7h. 19m. 49s., N. $8^{\circ} 34' 36''$. a 3, white; b 12, orange; c 10, flushed; dist. $a-b$, $35''$, $a-c$, $105''$. c is coarsely double with another 10 mag. A wide triple star, on the neck of the lesser Dog, $4\frac{1}{2}^{\circ}$ *n. p.* Procyon.

14.—7h. 51m. 21s., N. $2^{\circ} 35' 37''$. a 6, pale white; b 8, bluish; c 9, blue; dist. $a-b$, $75''$, $a-c$, $115''$. A wide triple star, $5\frac{1}{2}^{\circ}$ *s. f.* a , near ζ , $1\frac{1}{2}^{\circ}$ *f.* A line from β over a , and as far again, will touch ζ 13.

170 P. VII.—7h. 32m. 57s., N. $5^{\circ} 32' 37''$. a 7, white; b 8, ash-coloured; dist. $1''\cdot 4$. Very close. A good test-object for the telescope. There is a minute ash-coloured star preceding it by $2'$. 170 is considered to be a miniature of η Coronæ closely *s. f.* Procyon, $12'$ distant.

CAPRICORNUS.

One of the southern Zodiacal constellations, consisting of 51 stars, and containing some fine telescopic objects. Rises in May, culminates in August, and sets in December. N. Antinous and Aquarius, E. Aquarius, S. Pisces Australis, W. Sagittarius.

Nebula and Cluster.

30 M.—R. A. 21h. 32m. 42s., S. D. $23^{\circ} 44' 15''$. A fine pale white nebula, resolved into stars by H.; very bright, with straggling streams of stars on its northern verge. Under the Sea-Goat's caudal fin. $6\frac{1}{2}^{\circ}$ due *s.* of γ . A line from α Aquarii, carried just $\frac{1}{2}^{\circ}$ *f.* δ Capricorni, and half as far again, will find it, where it *p.* 41, 6 mag. by 1° .

72 M.—20h. 46m. 0s., S. $13^{\circ} 2' 6''$. A globular cluster of minute stars between the neck of the Goat and Aquarius, 3° nearly due *s.* of the star μ 6 Aquarii, a little *p.* 9° *f.* the group α^1 and α^2 , Capricorni, and on the parallel of R. A.

Double Stars.

α^2 and α^1 , 5, 6 Giedi, Prima and Secunda.—20h. 10m. 33s., S. $12^\circ 57' 38''$. α 3, pale yellow; b (which is α^1) 4, yellow; α 16, blue; α 9, ash-coloured; b $9\frac{1}{2}$, lilac tinge; dist. $a-\alpha$, $5''\cdot 0$, $a-\alpha$, $198''$, $a-b$, $373''$, $b-b$, $43''$. A double star to the naked eye, but a quintuple star in the telescope. A most difficult object, requiring a fine eye and a first-class instrument. "With 320 I could not see the small star."—H. On the tip of the Sea-Goat's right horn, the northernmost of the two stars which mark the head, and point to the Eagle, nearly on a line with the three bright stars in Aquila.

β^2 9.—20h. 13m. 25s., S. $15^\circ 12' 21''$. α $3\frac{1}{2}$, orange-yellow; b 7, sky-blue; dist. $204''\cdot 8$. A wide pair of stars, Dabih Major and Dabih Minor of the catalogues. In the middle of the Goat's right horn, $2\frac{1}{2}$ s. f. α^2 . β^2 is followed by a coarse double star.

α^2 12.—20h. 22m. 9s., S. $19^\circ 1' 35''$. a 6 and b 7, both bluish; dist. $21''\cdot 8$. A fine double star, at the root of the Goat's right ear, one of a group, 3° s. f. β .

ρ 11.—20h. 21m. 10s., S. $18^\circ 15' 25''$. a 5, white; b 9, pale lilac; c $7\frac{1}{2}$, yellow; dist. $a-b$, $3''\cdot 8$, $a-c$, $236''$. A close double star, with a distant companion, one of the above-mentioned group; on the Goat's ear, 2° n. f. σ .

σ 7.—20h. 11m. 37s., S. $19^\circ 32' 19''$. a $5\frac{1}{2}$, yellow; b 10, violet; dist. $45''\cdot 1$. A wide double star on the Goat's forehead, the preceding star of the group, $4\frac{1}{2}^\circ$ s. f. β .

396 P. XIX.—19h. 59m. 15s., S. $13^\circ 18' 42''$. a $8\frac{1}{2}$, pale yellow; b 14, blue; dist. $15''$. A most delicate double star, p , the tip of the Goat's right horn, 3° p. α^1 and α^2 , close to 65 .

"20h. 36m., S. 16° , is a pretty pair. a 8, lilac; b 9, bluish green; $1\frac{1}{4}^\circ$ f. 240 P. XX., a little n."—Webb. 2° s. f. the group τ^1 , τ^2 . 6° f. β , a little s. of the parallel of R. A.

CASSIOPEA.

A small constellation in the *Via Lactea*, very rich in clusters and double stars, easily distinguished by its W shape, the preceding V having an acute angle at its apex, the following V obtuse. It consists of 55 stars, of which 5 are of the 3rd mag., the rest smaller. The symbol is that of a lady in her chair, and she swings round the pole in all positions, from upright to inverted and back again. When the Bear is at its lowest position below the pole, Cassiopea, on the opposite side of the pole, is near the zenith, and *vice versa*. Her feet touch the Arctic circle, and her head passes vertically over England and Ireland. The constellation never sets to London. N. the Polar Regions; E. the Camelopard and Perseus; W. Cepheus.

Clusters.

22 H.—R. A. 0h. 19m. 34s., N. D. $70^\circ 38' 37''$. A loose rich cluster of small stars, embracing a double star (see below). "This object affords a fair test for trying the light and defining power of a telescope."—Smyth. f. the knee of Cepheus, 8° n. of κ , and a little n. of the parallel of R. A. of β Cephei.

28 H.—0h. 25m. 28s., N. $62^\circ 31' 59''$. A large straggling cluster $8'$ or $9'$ in extent, containing a neat double star (see below). Closely f. κ , on the chair of Cassiopea. κ is a very beautiful star of a bright yellow colour, 4th mag. A gorgeous neighbourhood.

30 H. VI.—23h. 50m. 19s., N. $55^{\circ} 57' 56''$. A fine galaxy cluster of minute stars, on a ground of fine star-dust, known as Miss Herschel's crab-cluster, discovered by her in 1783. Resembling the claws of a crab, and embracing the minute close double star (see below). "The crab itself is but a mere condensed patch in a vast region of inexpressible splendour, spreading over many fields." On the upper part of the lady's chair, 1° n. of the group close to σ . A line from κ over β , and carried within 1° as far again, will pass a little to the n. of it, and place it in the field with a low power.

31 H. VI.—1h. 36m. 57s., N. $60^{\circ} 33' 44''$. A cluster, in a field of large and small stars, in which there are several pairs (see Double Stars), near the lady's knee, just n. of the star 44. If a line be drawn from δ to ϵ , the object will be found 1° f. a point midway in the line.

42 H. VII.—1h. 10m. 42s., N. $58^{\circ} 4' 52''$. A brilliant group of large and small stars, embracing a fine double star (see below). Very much more resembling a bird in flight than 52 M. in Cepheus. 2° s. and 1° p. δ , in the field, and just p. ϕ . A line from κ over γ , and produced as far again, will find it.

46 H. VII.—1h. 36m. 45s., N. $61^{\circ} 12' 34''$. A cluster of stars 10th to 14th mag., triangular shape, below the lady's right knee, nearly $\frac{3}{4}$ the distance from δ to ϵ , nearer to ϵ , 1° n. of the object 31 H. VI.

64 H. VIII.—0h. 59m. 51s., N. $60^{\circ} 52' 55''$. A loose cluster of small stars, 9th to 14th mag., discovered by Miss Herschel. Rather more than $\frac{1}{2}$ the distance from δ to κ , a little n. of the line.

78 H. VIII.—0h. 35m. 30s., N. $61^{\circ} 2' 57''$. A cluster 9th to 10th mag. stars, containing a small double star. a 9 and b 10, both white; dist. $15''$. Discovered by Miss Herschel, extending $15'$ or $20'$, nearly midway between γ and κ .

103 M.—1h. 24m. 18s., N. $59^{\circ} 59' 24''$. A brilliant fan-shaped group, on the lady's knee, containing a double star (see Double Stars). 1° n. f. δ , on a line towards ϵ . Not marked on the Globe Atlas, or Maps S. D. U. K.

124 H.—1h. 20m. 28s., N. $61^{\circ} 35' 39''$. An open cluster, of an hour-glass shape, $\frac{1}{2}$ of the way from ϵ towards γ .

146 H.—1h. 35m. 0s., N. $55^{\circ} 11' 48''$. A loose cluster, 10th to 13th mag., divided into two distinct groups, containing a double star (see Double Stars). A line from κ over γ and ϕ , and produced the same distance beyond ϕ as that star is from γ , will find it.

Double Stars.

α 18 Schedir.—0h. 32m. 52s., N. $55^{\circ} 47' 46''$. a 3, pale rose-tint; b 10, smalt-blue; dist. $96''\cdot 9$. A fine star, with a distant companion, the lucida of the constellation; variable. "That the fluctuations in splendour of this star should have heretofore escaped notice is not extraordinary, since the difference between its greatest and least brightness can hardly be estimated at so much as half a magnitude."—H. Period about 200 days. On the right breast of the lady. a is the most southerly of the five bright stars in Cassiopea, and forms the apex of the preceding V of the W.

NOTE—"Astronomy is largely indebted to the indefatigable Miss Herschel, for, besides her continuous task as the Slough Amanuensis, she was assiduous as an observer, and with her little Newtonian sweeper, of only 27 inches focal length, and field of $2^{\circ} 12'$, under a power of 20, she discovered various clusters and nebulae, and no fewer than five comets, of which that of 1795 is the wonderful short period one, designated Encke's."—Smyth.

β 11 Caph.—0h. 1m. 59s., N. $58^{\circ} 17' 10''$. a $2\frac{1}{2}$, whitish; b $11\frac{1}{2}$, dusky; dist. $201''$. A bright star, with a very minute companion. a is considered variable from the 2nd to the 4th mag. On the back of the lady's chair. The preceding star of the five, forms a triangle with a and γ .

γ 27.—0h. 48m. 33s., N. $59^{\circ} 58' 58''$. a 3, brilliant white; b 13, blue; dist. $350''$. A fine contrast with the neighbouring stars, on the hip of Cassiopea; a very rich field, forms a nearly equilateral triangle with a and β . γ and δ are the pointers to the great cluster of stars in the sword-handle of Perseus, at twice the distance beyond.

η 24.—0h. 40m. 52s., N. $57^{\circ} 6' 2''$. a 4, pale white; b $7\frac{1}{2}$, purple; dist. $9''$. "A superb physical object."—Smyth. Binary, period about 700 years. " a $3\frac{1}{2}$, yellow; b 8, blue; dist. $9\frac{1}{2}''$ ". In 63 years the angle of position has increased 33° , and the distance diminished about $2''$.—Bishop. The companion more difficult from its peculiar colour than that of Polaris. Less than half-way, and a little out of the line from a to γ .

ι 35.—72 P. II.—2h. 17m. 58s., N. $66^{\circ} 47' 37''$. a $4\frac{1}{2}$, pale yellow; b 7, lilac; c 9, fine blue; dist. $a-b$ $2''\cdot 1$, $a-c$ $7''\cdot 5$. A fine triple star, the colours in striking contrast, under the lady's right foot; a good test-object, "There has been a little confusion as to the identity of this object, Sir W. Herschel having entered it as 55 Cassiopea, and others calling it ι , but it is quite clear that it is as above (72 P. II.), and the 292 of the *British Catalogue*."—Smyth. " 1 35.— a 6, yellow; b 8 and c 10, blue; dist. $a-b$, $2''\cdot 6$. a and b suspected binary, c appears fixed."—Bishop. ι 35 is designated ι Cassiopea in the *Notes of Bishop's Catalogue*, and Bishop's magnitude of a differs from the *British Catalogue*, and *British Association Catalogue*. "72 P. II. is the ι of the Catalogues of Dorpat and Rome."—Webb. " ι Cassiopea is identical with 72 P. II., 35 of Hevelius, 332 Bradley, Object XCVII. of Smyth's *Cycle*, 744 *British Association Catalogue*, 292 *British Catalogue*, 4412 of Lalande, and 262 of Struve. The 1 in *Bishop's Catalogue* is a misprint for ι ."—J. Baxendell, Esq., F.R.A.S. There are three stars numbered 35 in Cassiopea—35 of Flamsteed, which is ι , the above object; 35 of Hevelius, and 35 Piazz, which is close to ϕ 34, a $7\frac{1}{2}$ mag. star in the cluster 42 H. VII., and No. 390 of the *British Association Catalogue*. ι 35 makes an equilateral triangle with ϵ and ψ . A line from δ just $p. s.$, and produced as far again, will find it.

κ 15.—0h. 25m. 20s., N. $62^{\circ} 11' 13''$. a 4th mag., bright yellow. κ is a fine pointer-star, in the neighbourhood of several magnificent groups, at the northern angle of a trapezium formed by a , β , γ , κ .

μ 30.—0h. 58m. 51s., N. $54^{\circ} 16' 10''$. a $5\frac{1}{2}$, deep yellow; b 14, pale blue; c 11, bluish; dist. $a-b$, $50''$, $a-c$, $276''$. A coarse triple star, on the lady's right elbow. " $18' s.$ of μ is a star 6th mag., followed nearly on the parallel, $11''$ distant by a 9th mag.; both are remarkable for being *red*, of a decided but not deep tint."—Smyth. μ is close to θ , both make a wide double star to the naked eye. A line from β to a point just midway between a and η , and produced as far again, will find θ , and μ precedes it by 1° , nearly on the parallel of R. A.

σ 8.—23h. 52m. 10s., N. $54^{\circ} 52' 47''$. a 6, flushed white; b 8, smalt-blue; dist. $3''$. "The large star is green, the small one decidedly blue."—Bishop. A beautiful double star, on the lady's left elbow, a miniature of ϵ Bootis. In the observation of this star Admiral Smyth made use of a contrivance of Sir John Herschel's, viz., a central paper disc of two inches diameter applied to the object-glass. It occasions a diminution of light, but greatly improves the images of the stars, giving them sharper definition. It has been successfully

used by H. in the resolution of some of the very close double stars. A line from κ carried just *f.* β , and rather less than as far again, will find it. One of a group.

" ϕ 34.—1h. 10m., N. $57^{\circ} 30'$. A 5th mag. star, attended by a beautiful group 42 H. VII."—Webb.

ψ 36.—1h. 16m. 24s., N. $67^{\circ} 25' 24''$. *a* $4\frac{1}{2}$, orange; *b* 9, blue; *c* 11, reddish; dist. *a*—*b*, $33''\cdot 9$, *b*—*c*, $3''$. A fine triple star, a delicate test-object, on the lower part of the lady's chair. A line from *a* carried a little preceding γ , and produced $1\frac{1}{4}$ times the distance between these two stars, will touch it. ψ forms the preceding angle of an equilateral triangle with ϵ and 35 Flamsteed.

4.—20h. 18m. 50s., N. $62^{\circ} 32' 30''$. *a* 5, pale yellow; *b* 9, yellowish; *c* 11 and *d* 13, both blue; dist. *a*—*b*, $97''\cdot 5$, *a*—*c*, $218''$, *c*—*d*, $10''$. A coarse quadruple star, between the lady's chair and Cepheus. A line from *a* carried to a point 1° *n.* of β , and produced rather more than as far again, will find it.

9.—23h. 57m. 18s., N. $61^{\circ} 32' 10''$. *a* 6, white; *b* 11 and *c* 12, both dusky; dist. *a*—*b*, $80''$, *a*—*c*, $150''$, *a*—*d*, $244''\cdot 5$. A wide quadruple group, between the chair of Cassiopea and the hand of Cepheus. 3° *n.* a little *p.* β , *f.* 4 on the parallel of R. A.

22 H.—0h. 19m. 34s., N. $70^{\circ} 38' 37''$. *a* $8\frac{1}{2}$ and *b* 11, both greyish. A coarse double star in a cluster (see above).

28 H.—0h. 25m. 28s., N. $62^{\circ} 32' 0''$. *a* 10, *b* 11, both pale grey; dist. $6''\cdot 5$. A neat double star in a cluster (see above).

35.—1h. 11m. 55s., N. $63^{\circ} 56' 57''$. *a* 7, white; *b* 9, flushed white; dist. $49''\cdot 7$. A wide double star. A line from δ carried 5° due *n.* will touch it, or a line from *a* just *f.* γ , and produced as far again, will place it in the field. This star is 35 Flamsteed.

40.—1h. 27m. 47s., N. $72^{\circ} 21' 4''$. *a* 6, yellow; *b* 12, pale blue; dist. $42''$. A double star, between the right foot of Cassiopea and right foot of Cepheus. A line from 35 Hevelius to the bright star γ Cephei, will pass over it, at less than mid distance.

55.—2h. 11m. 31s., N. $65^{\circ} 23' 24''$. *a* 6, yellowish; *b* 11 and *c* 9, both greyish; diff. in R. A. *a*—*b*, $1''\cdot 8$; *a*—*c*, $120''$. A star with two distant companions. To the *n.* of this object is the spot where the new star suddenly burst forth in full splendour in November, 1572. A line from δ to ϵ , and as far again, reaches the star 35. 55 is $\frac{3}{4}$ of the distance from ϵ to 35 (Hevelius), a little out of the line *p.*

78 H. VIII.—0h. 35m. 31s., N. $61^{\circ} 2' 57'$. *a* $8\frac{1}{2}$, *b* 11, both pale white; dist. $12''$. A small double star in a cluster (see above).

101 P. XXIII.—23h. 23m. 48s., N. $57^{\circ} 48' 20''$. *a* 5, light yellow; *b* $7\frac{1}{2}$, white; *c* 14, blue; dist. *a*—*b*, $74''$, *a*—*c*, $20''$. A multiple star, between the chair of Cassiopea and the head of Cepheus. *b* has been discovered double, dist. $1\frac{1}{2}''$, by the Rev. W. R. Dawes. This star is 1 of Hevelius. A line from γ carried a little *n.* of β , and less than as far again, will find it.

181 P. O.—0h. 40m. 21s., N. $50^{\circ} 42' 20''$. *a* $7\frac{1}{2}$, flushed white; *b* 9, white; dist. $2''\cdot 4$. A close double star, between the knee of Andromeda and the head of Cassiopea. A line from κ carried a little *f.* *a*, and produced as far again, will touch the star ν 25, and 181 will be found a little *n.*

CEPHEUS.

About the same extent as Cassiopea, and occupying a similar position, with reference to the Pole. Cepheus never sets to Great Britain. It is by no means so rich a constellation, nor so well marked to the naked eye as Cassiopea; and consists of 35 stars. N. the Polar Regions; E. Cassiopea; S. Cygnus and Lacerta; W. Draco.

Clusters.

42 H. VI.—R. A. 20h. 18m. 47s., N. D. $60^{\circ} 11' 14''$. A large and rich cluster of minute stars, of a fan-shaped figure, near the left elbow of Cepheus. A line from α carried $\frac{1}{2}^{\circ}$ s. of η , and half the distance beyond, will touch it.

52 M.—23h. 18m. 16s., N. $60^{\circ} 51' 18''$. A triangular-shaped cluster of stars, "resembling a bird with outspread wings, with an orange star, 8th mag., at its vertex, in a fine field."—Smyth. "A pretty, rich, irregular cluster of stars, 13th mag., all separated, 6' diam., with a ruddy star, 9th mag., in the preceding part."—H. A line from α Cassiopeæ over β Cass., and as far again, will find it, 1° s. of the triple star 4 Cassiopeæ.

76 H. IV., 2084 H.—20h. 31m. 57s., N. $59^{\circ} 39' 48''$. A fine cluster on the left arm of Cepheus, "seems to be an enormous cluster, immensely distant."—H. "A new spiral with four branches, three of which terminate in knots."—Lord Rosse. 2° s. p. η , less than 1° s. f. of 42 H. VI.

Double Stars.

α 5 Alderamin.—21h. 15m. 18s., N. $62^{\circ} 0' 52''$. α 3, white; b and c 10, both pale blue; dist. α — b , $150''$. A fine star, with two distant companions, on the left shoulder of Cepheus. α and β are two bright stars nearly on the line to Polaris, which is twice their distance beyond.

β 8 Alphirk.—21h. 56m. 51s., N. $69^{\circ} 58' 15''$. α $4\frac{1}{2}$, white; b 7, blue; dist. $13''\cdot 7$. On the left side of the girdle of Cepheus, 8° , or $\frac{1}{2}$ of the distance from α to Polaris, a little f. the line.

γ 35 Alrai.—23h. 33m. 47s., N. $0^{\circ} 12' 33''$. α 3, yellow; b 14, dusky. A coarse pair of stars on the right foot of Cepheus. β , γ , and Polaris form an obtuse-angled triangle, having two of its sides equal. γ derives an interest from the fact that 2,360 years hence it will become the polar star.

δ 27.—22h. 24m. 9s., N. $57^{\circ} 43' 31''$. α $4\frac{1}{2}$, orange; b fine blue; dist. $40''\cdot 9$. A wide and remarkably fine double star, p. the crown of Cepheus, resembling β Cygni. " $4\frac{1}{2}$ is slightly variable, period 5d. 8h. 30m. Argelander adds 18m.; Schmidt suspects variation in many stars of Cepheus."—Webb. δ is the last star following the fine group which adorns the front of the monarch's tiara.

η 3.—20h. 42m. 31s., N. $61^{\circ} 18' 38''$. α $3\frac{1}{2}$, pale yellow; b 13, dusky; dist. $45''$. A bright star, with a distant and minute companion, on the bend of the left arm, the southernmost of the line of the three bright stars, γ , β , η .

κ 1.—20h. 14m. 52s., N. $77^{\circ} 18' 13''$. α $4\frac{1}{2}$, bright white; b $8\frac{1}{2}$, smalt-blue; dist. $7''\cdot 5$. A very beautiful double star, the colours in fine contrast, on the left instep, at the preceding angle of a nearly equilateral triangle formed with γ and β .

ξ 17.—21h. 59m. 52s., N. $63^{\circ} 58' 13''$. α 5 and b 7, both bluish; dist. $5''\cdot 5$. A fine and close double star, under the right arm of Cepheus. A line from κ

over β , and produced nearly as far again towards the vertical line of small stars comprising the crown of Cepheus, will find it; or a line from η , carried $\frac{1}{2}^\circ$ s. of α , and produced a little more than as far again, will strike it. Lies nearly midway between β and δ .

\circ 34.—23h. 13m. 4s., N. $67^\circ 22' 22''$. a 7, orange-yellow; b 9, deep blue; dist. $2''\cdot 5$. A very beautiful double star, the colours finely contrasted. One of a chain of small stars extending in a curve line from γ , through \circ , ι , ξ , α , and τ . \circ lies at one angle of an equilateral with β and γ .

π 33.—23h. 3m. 36s., N. $74^\circ 39' 29''$. a 5, deep yellow; a 10, purple; b 12, blue; diff. in R. A., $a-b$, $11''\cdot 8$; dist. $a-a$, $1''\cdot 8$. A close double star, with a distant minute companion, which is an exceedingly difficult object. The nearest star towards γ in the curve of stars from γ to β .

ι 11 and ι 12 P. XXII.—22h. 4m. 2s., N. $58^\circ 37' 59''$. a 6 and b $6\frac{1}{2}$, both white; b 7, pale; dist. $a-b$, $21''\cdot 4$, $b-b$, $0''\cdot 5$. A fine double star, on the neck of Cepheus. Struve discovered b to be a close double star. Close to the star λ , one of the vertical line in the tiara of Cepheus, pointed at by α and ν , at the same distance beyond.

ι 91 P. II.—2h. 48m. 17s., N. $78^\circ 52' 52''$. a 6, orange; b $10\frac{1}{2}$, smalt-blue; dist. $5''\cdot 2$. A double star, discovered by Struve. "A charming object."—Smyth. In a blank region to the naked eye; difficult to find, from the absence of star-pointers. A line from γ Ursæ Minoris, carried over Polaris, and half the distance beyond, will touch it; or, a curved line from β Cephei through γ , and 1° less than as far again, will show it. This object is identical with Hevelius's 47, on the Maps, and is included in Cassiopea by the *British Association Catalogue*, No. 896.

248 P. XXI.—21h. 34m. 46s., N. $56^\circ 52' 49''$. a 6, pale yellow; b and c , both $8\frac{1}{2}$, and both grey; dist. $a-b$, $11''\cdot 7$, $a-c$, $19''\cdot 7$. A neat triple star, on the back of the head of Cepheus, $1\frac{1}{2}^\circ$ s. of the "Garnet Sidus," identical with the star ι 3 Hevelius.

256 P. XXI.—21h. 36m. 10s., N. $56^\circ 58' 14''$. a 8, white; b 9, pale violet; dist. $12''\cdot 5$. A very neat double star, closely f. the last-named object.

285 P. XXI.—21h. 39m. 23s., N. $58^\circ 9' 33''$. a 6, deep orange tint; b 10, opal-blue; diff. in R. A. $5''$. The celebrated "garnet star" of Piazzi's catalogue. "It is of a very fine deep garnet colour, such as the periodical star \circ Ceti was formerly, and a most beautiful object, especially if we look for some time at a white star before we turn our telescope towards it, such as α Cephei, which is near at hand."—H. On the line from ϵ to η , rather more than $\frac{1}{2}$ the distance. η , α , and ν , form a curve of stars, from the last of which hangs the garnet-star, $2\frac{1}{4}^\circ$ s. of ν 10.

CETUS.

A very large and rather a blank constellation, situated principally in the southern hemisphere, distinguished by only a few bright stars to the naked eye. Consists of 97 stars, α (Menkar), on the upper jaw of the Whale, 2nd mag., ι 1 of 3rd mag., of which Mira on the neck, and β on the tail, are the most remarkable. Rises east by north in August, culminates in November, and sets in January. Cetus is the most extensive constellation in the whole firmament, embracing the large space to the south under Pisces and Aries. N. Pisces and Aries; E. Taurus and Eridanus; S. Eridanus; W. Aquarius.

Nebulæ.

1 H. V.—R. A. 0h. 40m. 59s., S. D. $26^{\circ} 1' 53''$. A long narrow nebula, discovered by Miss Herschel, 1783; the southern portion the brighter, preceded by a 9th mag. reddish star; difficult to find, from the absence of star-pointers; in the south, towards Apparatus Sculptoris, the figure of Cetus is traced by the waving line of stars α , γ , σ , ζ , θ , η , and β . β is the preceding star, and acts as pointer to the nebula, which is 7° s. and 1° f.

23 H. IV.—2h. 20m. 41s., S. $1^{\circ} 44' 45''$. A nebula with a planetary aspect, round, bluish-white, very distinct, and brightening towards the centre. In the middle of the Whale's neck, on a line, and $\frac{3}{4}$ the distance from γ to Mira. 1° p. the star 75.

64 H. I.—2h. 39m. 22s., S. $8^{\circ} 8' 40''$. An oval nebula, very distinct, with a bright centre; on the fringe of the Whale's neck. On a line from Azha (η Eridani) to Mira, within 3° of the former star.

77 M.—2h. 35m. 46s., S. $0^{\circ} 34' 43''$. A round nebula, very bright, and exactly in a line with three small stars, one p. and two f. "A blue spiral, form of centre seen."—Lord Rosse. The sketch shows a stellar nucleus surrounded by a bright circular disc, enveloped by a dark ring, beyond which there is an extension of the nebula in an elliptical form at the root of the Whale's lower jaw. A little s. of the line from α to σ , nearly midway. 1° s. f. δ , and 3° s. of γ .

100 H. I.—1h. 24m. 35s., S. $7^{\circ} 34' 0''$. A bright round nebula, just over the Whale's back. Nearly s. is a neat double star 9th and 11th mag. A line from η through θ , and half as far again, will find it.

Double Stars.

α 92 Menkar.—2h. 55m. 18s., N. $3^{\circ} 33' 34''$. a $2\frac{1}{2}$, bright orange; b 10, pale grey; diff. in R. A. 29s.6. a is the leader of Cetus, and a fine object. It is very singular, that of all the double stars catalogued in this constellation, with one or two exceptions, the primary is of an orange or yellow colour. A line from Capella through the Pleiades will reach Menkar.

β 16 Diphda.—0h. 36m. 49s., S. $18^{\circ} 42' 39''$. a $2\frac{1}{2}$, yellow; b 12, pale blue; dist. $542''$. A fine star, with a distant companion, midway between Mira and Fomalhaut. " β is certainly larger than α ."—Smyth.

γ 86 Kaffaljidma.—2h. 36m. 19s., N. $2^{\circ} 40' 0''$. a 3, pale yellow; b 7, lucid blue; dist. $2''\cdot6$ ($3''\cdot7$ H. 1826). A close double star, a beautiful object; colours in fine contrast. In the Whale's mouth, 5° p. α , a little s.

ζ 55 Kaitos.—1h. 44m. 48s., S. $11^{\circ} 0' 6''$. a 3, topaz-yellow; b 9, white; dist. $165''$. On the back of Cetus. On the line of γ and σ , the same distance beyond.

η 31.—1h. 1m. 47s., S. $11^{\circ} 53' 38''$. a $3\frac{1}{2}$, yellow; b 10, livid; dist. $239''$. On the tail of Cetus. A line from α carried a little n. of σ , and as far again, will find it. One of a group.

ι 8.—0h. 12m. 33s., S. $9^{\circ} 34' 22''$. a 4, bright yellow; b 15, deep blue; dist. $45''$. A wide double star on the tip of the northern fin of the tail, a very difficult object; forms the preceding apex of a nearly equilateral triangle with η and β .

μ 87.—2h. 38m. 37s., N. $9^{\circ} 32' 35''$. a 4, pale orange; b 11, cinereous; diff. in R. A. 1s.5. A star with a close companion, on the hind right hoof of Aries, where it forms a nearly equilateral triangle with α and γ Ceti. Not lettered on the Maps.

ν 78.—2h. 28m. 47s., N. $5^{\circ} 0' 11''$. a $4\frac{1}{2}$, pale yellow; b 15, blue; dist. $6''.0$. A beautiful double star, in the Whale's eye, the companion, is a *difficilis* of Struve, nearly midway between γ and ξ .

ο 68 Mira.—2h. 12m. 32s., S. $3^{\circ} 35' 17''$. a varying from 2 to 10, and thence to invisibility, reddish-yellow; b 10, pale lilac; dist. $116''$. The celebrated variable star Mira, "the wonderful;" first discovered variable by David Fabricius, in 1596. One of the brightest stars in Cetus, being frequently, though not always, 2nd mag. at its maximum brilliancy. "It retains its greatest brightness for about 14 days, and then decreases to complete invisibility; remains invisible for five months, when it reappears, and increases gradually for three months, until it regains its maximum splendour, as a star of the 2nd magnitude. The entire period is about 322 days, but is not always the same, being alternately augmented and diminished to the extent of 25 days." —Dr. Lardner. H. makes its period to be 331 days, 10 hours, and 19 minutes.

The cause of the variability of certain stars remains still an impenetrable mystery to astronomers (see Algol).

12.—0h. 23m. 9s., S. $4^{\circ} 42' 17''$. a 6, topaz-yellow; b 15, bright blue; c 11, dusky; dist. $a-b$ $6''\cdot5$, $a-c$ $201''$. A double star with a distant companion, $3\frac{1}{2}^{\circ}$ n. of the tail of Cetus. A line from τ 52 over η , and produced as far again, will touch it.

26.—0h. 56m. 52s., N. $0^{\circ} 38' 36''$. a $6\frac{1}{2}$, pale topaz; b $9\frac{1}{2}$, lilac tint; dist. $16''\cdot4$. A fine double star, over the Whale's back, just midway on a line from ζ to Algenib in Pegasus.

37.—1h. 7m. 34s., S. $8^{\circ} 39' 6''$. a 6, white; b $7\frac{1}{2}$, light blue; c 8, yellow; d 10, violet; dist. $a-b$ $50''\cdot6$, $c-d$ $20''\cdot5$. A wide quadruple, or rather a double double star. A line through $a-b$ points to $c-d$, $2\frac{1}{4}^{\circ}$ p. θ on the parallel of R. A. A line from β over η strikes it at about $\frac{1}{4}$ of the distance beyond.

42.—1h. 12m. 54s., S. $1^{\circ} 14' 4''$. a 6, bright white; b 8, white; dist. $1''\cdot5$. A close double star, in a group s. of the ribbon of Pisces, 8° n. and 1° p. θ Ceti.

61.—1h. 56m. 53s., S. $0^{\circ} 59' 11''$. a 7, pearly white; b 11, greenish; c 7, white; d $8\frac{1}{2}$, blue; dist. $a-b$ $39''$, $c-d$ $4''\cdot6$. A double-double star, behind the crest of Cetus, pointed to by τ and χ , at 1° less than twice the distance.

66.—2h. 5m. 53s., S. $3^{\circ} 1' 27''$. a 7, pale yellow; b $8\frac{1}{2}$, sapphire-blue; dist. (1800) Piazz, $19''$, (1821) Struve, $16''$, (1845) Bishop, $15''$. An interesting binary star, 2° p. Mira, a little n.

84.—2h. 34m. 11s., S. $1^{\circ} 16' 9''$. a 6, pale yellow; b 14, lilac; dist. $5''$. A delicate and beautiful double star, on the throat of Cetus, 1° s. f. δ , near 77 M.

94.—3h. 5m. 55s., S. $1^{\circ} 42' 7''$. a $5\frac{1}{2}$, pale cream-colour; b 16, dusky; dist. $5''$. A most delicate double star. b is registered by H. as of the 19th mag., and Smyth calls it the *minimum visible* of his telescope; under the Whale's lower jaw, 6° s. f. a . A line from λ 91 through a , and as far again, will precede 94 by 1° .

113 P. O.—0h. 27m. 35s., S. $5^{\circ} 17' 31''$. a 7, creamy-yellow; b 9, smalt-blue; dist. $20''$. A neat double star, over the tail of Cetus, near the stars 12 and 13. A line from τ over η , and carried as far again, will strike the star 12, and the object will be found on the line within 1° of 12.

146 P. O.—0h. 33m. 49s., S. $5^{\circ} 5' 32''$. a $6\frac{1}{2}$, pale topaz; b 9, violet tint; dist. $57''\cdot9$. A neat double star, over the tail of Cetus. A line from τ carried a little n. of η , and as far again, will point out the pair of stars 13, 14. On that line, 1° less, the object will be found.

191 P. I.—1h. 44m. 52s., N. $10^{\circ} 8' 31''$. a $7\frac{1}{2}$, b 8, both lucid white; dist. $3''\cdot6$. A close and beautiful double star, on the knee of the left fore-leg of Aries; absurdly included in Cetus. 21° due n. of ζ , on the same parallel of Declination.

227 P. I.—1h. 53m. 8s., S. $6^{\circ} 15' 46''$. a $7\frac{1}{2}$, yellowish; b 8, light blue; c $9\frac{1}{2}$, violet. A star pointing to a distant pair; close under the Ram's fore-foot, 4° n. of Okda, a little p .

CLYPEUS (or Scutum) SOBIESKI.

A small asterism in one of the richest parts of the Milky Way, containing some fine objects and magnificent low-power fields. It was formed by Hevelius in honour of John Sobieski, king of Poland, and embraces several of Messier's grand clusters (11, 16, 17, 18, 24, 25, and 26). The northern part, near 11 Messier, is visible to the naked eye as a patch of condensed star-dust. Consists of seven stars—two of the 4th magnitude, the rest smaller. A line of three bright stars, γ and δ Aquilæ, and λ Antinói, point to the shield at the same distance beyond. Culminates in July. Lies to the north of Sagittarius, between Antinous and Ophiuchus.

Nebula.

17 M.—R. A. 18h. 12m. 49s., S. D. $16^{\circ} 15' 23''$. "A magnificent arched, and irresolvable nebulosity, in a splendid group of stars."—Smyth. "A most curious object, not unlike the nebula in Orion: there is a resolvable portion or knot distinctly separated from, and insulated in the rest, as if it had absorbed the nebula near it. Its light is not equable, but blotty. Its form is that of the Greek capital Ω , with the left or following base-line turned upwards; the curved or horse-shoe part is very faint, and has many stars in it."—H. The extended base-line which fills the whole field is the only portion of the nebula visible in small telescopes. 17 M. is 5° from μ Sagittarii, on a line towards ϵ Aquilæ, $2\frac{1}{2}^{\circ}$ s. of 16 M., and 18° f. η Ophiuchi, nearly on the parallel of R. A., a little s. Find the group of stars in the centre of the shield, and 16, 17, 18 M. are easily found, being 2° p., and all three nearly on the same parallel of Declination.

Clusters.

16 M.—18h. 11m. 9s., S. $13^{\circ} 50' 9''$. A large scattered cluster in the Milky Way; the stars seem disposed in pairs. A line from α Herculis, carried 1° p. β Oph. and produced $1\frac{1}{2}$ times as far again, will strike 16 M.

24 M.—18h. 10m. 16s., S. $18^{\circ} 27' 11''$. A magnificent field of minute stars, visible to the naked eye; a little s. lies a gorgeous region, $2\frac{1}{2}^{\circ}$ n. of the bright star μ Sagittarii. A line from α Aquilæ over λ Antin., and produced as far again, will find it. "A double star follows in the s. f. quadrant, and a wider one s. p."—Smyth.

26 M.—18h. 35m. 49s., S. $9^{\circ} 31' 59''$. A coarse cluster, small, but very bright, on the upper part of the shield, close to the group of stars 1, 2, 3 Aquilæ, where it lies midway between λ Antin. and the group in the centre of the shield. "There is a small pair of stars in the upper portion of the field, 9 and 10 magnitudes."—Smyth.

Double Stars.

18 M.—18h. 12m. 3s., S. $17^{\circ} 11' 19''$. a 9, b 11, both bluish; dist. $35''$. A double star in a straggling cluster, below the shield. Several splendid fields about 1° to the s., 4° to n. by e. of μ Sagittarii, towards the Eagle's tail.

2002 H.—18h. 9m. 6s., S. $19^{\circ} 55' 13''$. a $8\frac{1}{2}$ and b 10, both grey; dist. $20''$. A double star p . a bright group, in the lower part of the shield, in a faint nebula, $1\frac{1}{2}^{\circ}$ to n . f . μ Sagittarii, near the star 26 P. XVIII.

COMA BERENICES.

A small constellation in the northern hemisphere, the central portion like a small star-cloud resolvable to the naked eye, containing some fine objects, consists of 43 stars, none of which exceed the 4th mag.; easily found. A line from Alkaid to Cor Caroli, and thence to Deneb, in the Lion's tail, will pass over the group at mid-distance between the latter two stars. Rises in December and sets in August. N. Canes Venatici; E. Bootes; S. Virgo; W. Leo.

Nebulæ.

24 H. V.—R. A. 12h. 29m. 36s., N. D. $26^{\circ} 43' 55''$. A large white elongated nebula, in the centre of the tresses. "A curious, long, streaky object, like a weaver's shuttle."—Smyth. H. supposes it to be a flat ring seen at great obliquity, $2^{\circ} f$. and $1^{\circ} s$. of the star 16, which is the lucida of the constellation.

64 M.—12h. 50m. 6s., N. $22^{\circ} 25' 2''$. A fine nebula, long, large, and bright, and blazing up to a nucleus in the centre, somewhat in shape like 31 M. H. thinks the nucleus is really a double star. There is a dark spot shown below the nucleus with a power of 240. It lies $1^{\circ} n$. f . the star 35. A line from Spica carried closely f . ϵ Virginis, and nearly half as far again, will find it.

85 M.—12h. 18m. 15s., N. $19^{\circ} 1' 40''$. A small nebula, 9° due s . of 16, and midway between the stars 11 and 24. A line from Spica over δ Virginis, and carried just as far again, will place it in the field.

Cluster.

53 M.—13h. 6m. 17s., N. $18^{\circ} 53' 17''$. A brilliant gathering of small stars, 11th to 15th mag., on a ground of fine star-dust, towards Virgo's left hand, $1^{\circ} n$. p . the star 42. A line from δ carried a little f . ϵ Virginis, and just as far again, will place it in the field.

Double Stars.

2.—11h. 57m. 22s., N. $22^{\circ} 12' 45''$. a 6, pearly white; b $7\frac{1}{2}$, lilac tint; dist. $3''\cdot6$. A beautiful object, just over the Lion's tail, midway between β Leonis and the tresses, a little p . the line of direction.

12.—12h. 15m. 43s., N. $26^{\circ} 35' 46''$. a 5, straw-colour yellow; b , rose-red; dist. $66''$. A bright star, with a distant companion, placed in a triangle of 8th or 9th mag. stars. In the tresses, $1\frac{1}{2}^{\circ} s$. f . 16, on the line to Deneb.

24.—12h. 28m. 21s., N. $19^{\circ} 7' 13''$. a $5\frac{1}{2}$, orange tint; b 7, emerald; dist. $20''\cdot5$. A fine object, the colours in brilliant contrast. Midway on a line from the star 16 to ρ Virginis.

35.—12h. 46m. 39s., N. $21^{\circ} 58' 49''$. a 5, pale yellow; b indistinct ("blue, or purplish"—Bishop); c 10 cobalt-blue; dist. $a-b$ $1''\cdot5$, $a-c$ $28''$. A delicate triple star, extremely difficult, midway between the tresses and Virgo's left hand. On the line from 42 Dup. to the tresses, less than midway.

42.—12h. 3m. 26s., N. $18^{\circ} 14' 34''$. a $4\frac{1}{2}$ and b 5, both pale yellow; dist. $0''\cdot3$. An excessively close and very difficult double star, discovered by Struve. A line from δ over ϵ Virginis, and carried as far again, will place it in the field.

A line from Arcturus carried just *n.* of Muphris, and less than twice the distance, will find it.

63 P. XIII.—13h. 15m. 14s., N. $18^{\circ} 28' 29''$. *a* 8, white; *b* 13, blue; dist. 15". A delicate object, *p.* the right foot of Bootes. $3^{\circ} f.$ 42, and nearly on the parallel of R. A.

202 P. XII.—12h. 45m. 15s., N. $19^{\circ} 54' 24''$. *a* $7\frac{1}{2}$, *b* 8, both white; dist. 16".2. A neat double star between the tresses and the left hand of Virgo. On the parallel of Arcturus, $21^{\circ} p.$ $2^{\circ} s.$ of 35 Dup.

CORONA BOREALIS.

A small and very beautiful constellation in the northern hemisphere, bearing some resemblance to an inverted crown; easily distinguished by the crescent form of the six stars ϵ , δ , γ , α , β , θ , following Bootes. Possesses some remarkably fine and very close double stars, consists of 21 stars, situated between Bootes and Hercules. Rises in January, culminates in May, and sets in October.

Double Stars.

a 5 Gemma.—R. A. 15h. 28m. 57s., N. D. $27^{\circ} 10' 3''$. *a* 2, brilliant white; *b* 8, pale violet; diff. in R. A., 11s.6. A fine star, the lucida of the corona, nearly in the front or centre. "There is a neat little double star nearly *p. a.* by 48s.3; between it and *a* is a red star 10th mag."—Smyth.

γ 8.—15h. 37m. 4s., N. $26^{\circ} 43' 30''$. *a* 6, flushed white; *b*, uncertain; *c* 10, pale lilac; dist. 1839, *a*—*b* $0''\cdot3$; *a*—*c*, diff. in R. A., 14s.5; 1842, *a*, *b*, round. "*a* is of the 4th and *b* of the 7th mag."—Bishop. An exceedingly difficult triple star, "closer than ζ Herculis."—Struve. A binary system, period not ascertained; placed in the curve, between *a* and δ .

ζ 7.—15h. 34m. 17s., N. $37^{\circ} 4' 38''$. *a* 5, bluish-white; *b* 6, smalt-blue; dist. 6". "The magnitudes are 4—5 and 5—6; the larger star white or yellowish white, the smaller purplish. Struve considered *a* greenish-white, and *b* greenish."—Bishop. A very fine double star, in the space *n.* of the corona; forms the *n.* apex of an isosceles triangle with θ 4 and δ Bootis.

η 2.—15h. 17m. 37s., N. $30^{\circ} 46' 44''$. *a* 6, white; *b* $6\frac{1}{2}$, golden-yellow; dist. $0''\cdot5$. "One of the most remarkable of the binary stars known, and one which has completed its orbit of revolution since first discovered;—period, 43.2 years, 1830."—H. A very severe test-object; "with 460 the stars are as fine a miniature of ϵ Bootis as that star is of α Geminorum."—H. A little out of the curve, *n. p.* A line from *a* over β will find it, at about half the distance beyond, in the direction of δ Bootis.

ν^1 and ν^2 20 and 21.—16h. 17m. 16s., N. $34^{\circ} 7' 8''$. *a* 5, pale yellow; *b* 12, garnet; dist. $137''\cdot0$. Forms a fine group with ν^2 , which is—*a* 5, deep yellow; and *b* 6, grey; closely *f.* at 6'. A little more than half-way on a line from ϵ Coronæ to η Herculis.

ρ 15.—15h. 55m. 53s., N. $33^{\circ} 43' 10''$. *a* 6, creamy-white; *b* 11, blue; dist. $80''\cdot0$. A line from β Coro. to η Herculis will pass $1\frac{1}{2}^{\circ} n.$ of the object, about half the distance.

σ 17.—16h. 9m. 37s., N. $34^{\circ} 12' 12''$. *a* 6, yellowish-white; *b* $6\frac{1}{2}$, smalt-blue; *c* 11, dusky-blue; dist. *a*—*b* $1''\cdot8$, *a*—*c* $44''\cdot2$. An exceedingly beautiful

and close double star, with a minute distant companion; both stars are certainly yellow. The smaller, of a paler hue, must be widening, as it is now an easy object with 200; and the minute attendant is not extinguished with 300. The stars are in a vertical line one over the other, the discs well defined. A binary system, period about 560 years. "A beautiful miniature of ξ Ursæ Majoris, only that the stars are more unequal."—H. "Perihelion passage in 1826, period 737 years."—Hind. Between ν^1 and ρ .

ν 18.—16h. 11m. 20s., N. $29^\circ 29' 9''$. a 6, b 10, c 9, and d 13, all bluish; dist. $a-b$ $86''\cdot 9$, $a-c$ $128''$, $b-d$ $10''$. A fine quadruple object. A line from δ carried just $n.$ of ϵ , and twice the distance beyond, will find it.

CORVUS.

A small asterism in the southern hemisphere, consisting of nine stars. Rises south by east, an hour before Spica, in February. Culminates in April, and sets in June. N. Virgo; S. and E. Hydra; W. Crater.

Double Stars.

β 9.—R. A. 12h. 27m. 18s., S. D. $22^\circ 38' 54''$. a $2\frac{1}{2}$, ruddy yellow; b 7, greenish yellow; c 8, dull grey; diff. in R. A. $a-b$, 27s.4, $a-c$, 28s. A fine star, the brightest in Corvus, with two companions, in the Raven's right claw. A line from η Virginis over δ Corvi, and produced half as far again, will find it. β is suspected of variability.

δ 7 Algorab.—12h. 22m. 52s., S. $15^\circ 45' 43''$. a 3, pale yellow; b $8\frac{1}{2}$, purple; dist. $23''\cdot 5$. A fine object, forms the $s.$ $p.$ angle of an equilateral triangle with Spica and γ Virginis.

CRATER.

A small asterism close to Corvus, containing 31 stars, none of which exceed the 4th mag. A line from Vindematrix over η Virgo will point out the Crater, at the same distance beyond. Rises in February, culminates in April, and sets in June. N. Virgo and Leo; E. Corvus; S. and W. Hydra.

Double Stars.

a 7 Alkes.—R. A. 10h. 53m. 14s., S. D. $17^\circ 34' 53''$. a 4, orange tint; b 8, intense blood-colour; c 9, pale blue; diff. in R. A. $a-b$ 42s., $b-c$ 4s.9. A star with two distant companions, on the base of the Cup. a is not now the lucida of Crater. A line from θ carried just $n.$ of δ , and as far again, will find it.

δ 12.—11h. 12m. 36s., S. $14^\circ 2' 58''$. a $3\frac{1}{2}$, pale orange; b 11, pale blue; diff. in R. A. 19s.8. δ is the present lucida of the constellation. At the $p.$ angle of a nearly equilateral triangle formed with β Virginis and δ Corvi.

γ 15.—11h. 18m. 9s., S. $16^\circ 56' 30''$. a 4, bright white; b 14, grey; dist. $3''$. A fine but delicate object in the centre of the Goblet, $3^\circ s.$ and $1^\circ f.$ δ . On the parallel of γ Corvi, and $12\frac{1}{2}^\circ p.$

17.—11h. 25m. 35s., S. $28^{\circ} 31' 15''$. a $5\frac{1}{2}$, lucid white; b 7, violet tint; dist. $10''$. The northernmost of a chain of vertical stars to the south of the Crater. A line from θ Virginis carried to a point 1° $f.$ γ Corvi, and the same distance beyond, will find it.

39 P. XI.—11h. 12m. 54s., S. $6^{\circ} 9' 34''$. a $8\frac{1}{2}$ and b 9, both bluish-white; dist. $8''$. A minute double star, between the Cup and the Lion's hind feet, midway between ϵ and ϕ Leonis. "About $45' p.$ is a fine pair, 7 and 9 magnitudes, white, and bluish or lilac."—Webb.

CYGNUS.

A very fine constellation, in one of the richest portions of the *Via Lactea*; five of its largest stars constitute a very elongated cross, of which α , γ , and β are in a line in the Galaxy, and form the tree of the cross, and δ , γ , and ϵ the beam. Consists of 81 stars, contains very few nebulae or clusters, but is very rich in double stars. The major part of Cygnus never sets to Great Britain. Rises in February, culminates in August, and partially sets in January. N. Draco and Cepheus; E. Lacerta and Pegasus; S. Vulpecula and Anser; W. Lyra.

Nebula.

73 H. IV.—R. A. 19h. 41m. 16s., N. D. $50^{\circ} 11' 8''$. A nebula of a singular appearance. H. and H. both considered it as a connecting link between the nebulous stars and the nebulae proper. It is like a star out of focus, preceded by two double stars. On the $p.$ wing of Cygnus, 5° due $n.$ of δ , 2° $f.$ θ , a little $n.$ of the parallel of R. A.

Clusters.

29 M.—20h. 19m. 12s., N. $38^{\circ} 3' 38''$. A cluster of minute stars, at the root of the Swan's neck, a little more than 2° $s.$ of γ , about $35' f.$ A line from ϵ to δ will touch it at $\frac{1}{3}$ of the distance, between the stars 34 and 44. A little $p.$ is a gorgeously rich neighbourhood.

39 M.—21h. 27m. 22s., N. $47^{\circ} 50' 21''$. A splendid group, in a superb region. Messier described it as 1° in diameter. Contains several fine pairs, between the Swan's tail and the Lizard. On a line from π^2 to α Cygni, $\frac{1}{3}$ of the distance.

Double Stars.

α 50 Arided or Deneb.—20h. 36m. 48s., N. $44^{\circ} 48' 7''$. a 1, brilliant white; b $12\frac{1}{2}$, pale blue; dist. $108''\cdot 5$. "The latter well seen while the former is hid behind the bar."—Smyth. A splendid star, the lucida of Cygnus, at the root of the Swan's tail, on the summit of the cross of Cygnus.

β 6.—19h. 25m. 17s., N. $27^{\circ} 40' 42''$. a 3, topaz-yellow; b 7, sapphire-blue; dist. $34''\cdot 4$. One of the finest of the double stars, the colours in brilliant contrast; on the Swan's bill, in the base of the cross of Cygnus. Pointed at by a line from Vega carried 1° $f.$ γ Lyrae, and rather less than as far again.

δ 18.—19h. 40m. 45s., N. $44^{\circ} 48' 8''$. a $3\frac{1}{2}$, pale yellow; b 9, sea-green and variable; dist. $1''\cdot 8$. A close and very beautiful object, binary. "An interesting binary star. Mr. Hind has calculated the elements of this star on the whole series of observations, between 1783 and 1842; the period of revolution appears to be 179 years, and the excentricity 0.607. The perihelion passage will take

place about 1860."—Bishop's Astronomical Observations 1839—1851. On the left wing, or the left arm of the cross, a little *n.* of the line from Arided to Vega.

ζ 64.—21h. 7m. 11s., N. 29° 40' 33". *a* 3, pale yellow; *b* 10, sky-blue; dist. 105". 0. A bright star, with a distant companion, on the right wing. ζ is an extension of the line of the beam of the cross, on the *p.* side, nearly midway between Scheat and Albireo. On the line from *a* Cygni to ε Pegasi.

λ 54.—20h. 42m. 9s., N. 35° 59' 42". *a* 5, *b* 10, and *a* 6, all bluish; dist. *a*—*a* 0".7, *a*—*b* 84".9. A very close double star, with a distant companion, on the pinion of the right or lower wing. On a line with δ and γ, 2½° due *n.* of ε, on the line to *a*, a little *f*.

μ 78.—21h. 38m. 4s., N. 28° 8' 10". *a* 5, white; *b* 6 and *c* 7½, both blue; dist. *a*—*b* 5".4, *a*—*c* 216".8. A fine double star, with a distant companion, suspected binary; on the tip of the right wing. It is found by a series of nearly equal steps from *a*, forming a curve line, *a*, γ, ε, ζ, μ, or a straight line—*a*, ν, ν, μ will find it. 3½° due *n.* of κ Pegasi, on the parallel of Declination.

χ 17.—19h. 41m. 18s., N. 33° 25' 14". *a* 5, golden-yellow; *b* 9, pale blue; dist. 25".7. 295 P. XIX. follows a little *s.* and is a variable star. Period 7 months, sometimes reaching 5th mag.; very red. χ is on the stem of the cross, 6½° from β towards γ. A line from ε Aquilæ over Albireo, and produced rather more than half as far again, will find it.

ψ 24.—19h. 52m. 9s., N. 52° 4' 54". *a* 5½, bright white; *b* 8, lilac; dist. 3".4. A fine object, in the space *n.* of the uppermost wing. A line from Albireo over δ, and carried a little more than ½ of the distance beyond, will find it. In a group 2° *f.* and 2° *n.* of θ.

ω³.—20h. 27m. 9s., N. 48° 45' 19". *a* 5, pale red; *b* 10, grey; dist. 55".2. In the group of stars 4° *n.* *p.* *a*, on a line from *a* towards δ Draconis. The group ω¹, ², ³, and the group ο¹, ², form a small triangle with *a*.

ι P. XXI.—21h. 2m. 55s., N. 29° 37' 57". *a* 6½, dull white; *b* 9, pale lilac; dist. 3".5. A neat double star, on the lower wing, closely *p.* ζ.

16.—19h. 38m. 14s., N. 50° 12' 45". *a* 6½, *b* 7, both pale fawn-colour; dist. 37".3. A fine object, on the tip of the northern wing, closely *f.* θ, a little *n.*

49.—20h. 35m. 34s., N. 31° 39' 17". *a* 6, golden-yellow; *b* 9, blue; dist. 3".2. A close double star, colours very decided, within 2½° of ε, *s.* *p.* A line from 61 over ε, will touch it.

52.—20h. 40m. 6s., N. 30° 13' 38". *a* 5½, orange; *b* 9½, blue; dist. 7". 3° due *s.* of ε. A line from Arided just *p.* ε will touch it at 3½° beyond. Near this star is the extraordinary branching nebula in the Milky Way, described and figured by Sir John Herschel, 15 H. II., *Phil. Trans.*, 1833.

59.—20h. 55m. 14s., N. 46° 59' 45". *a* 5½, orange tint; *b* 10 and *c* 13, both blue; dist. *a*—*b* 20", *a*—*c* 30". A delicate triple star in the Swan's tail. In the *f.* of the three groups which form a corona over Arided. 59 is ½ the distance from *a* to π¹.

61.—21h. 0m. 41s., N. 38° 3' 54". *a* 5½, yellow; *b* 6, deeper yellow; dist. 16". A most interesting and very beautiful double star; binary. Has a greater parallax than any of those stars whose parallax has been ascertained, except α Centauri, and is therefore concluded to be the nearest star in the northern hemisphere. 61 is easily found; on the line from *a* over ν and ν, half-way between ν and ν. Bessel found the parallax of 61 Cygni to be 0".3136, which would make it distant from our Sun 657,700 times the semi-axis of the earth's orbit, a distance which light would require 10.3 years to traverse, assuming the period of the revolution of one star around the other 540 years,

and an apparent semi-axis of 15". Bessel concludes that the masses of both stars are less than half the Sun's mass. The following are those stars whose parallax has been already ascertained:— α Centauri, δ Cygni, Vega, Sirius (1830, Groombridge), ι Ursæ Majoris, Arcturus, Polaris, and Capella.

149 P. XIX.—19h. 22m. 50s., N. $36^{\circ} 15' 25''$. a $8\frac{1}{2}$, white; b 9, pale blue; dist. 7". An elegant object, between the Swan's neck and the Lyre. In a group between χ and θ Lyræ, closely f . 4.

169 P. XIX.—19h. 26m. 40s., N. $27^{\circ} 58' 51''$. a 9, white; b 11, pale blue; dist. $5''\cdot 8$. A delicate object; in the Swan's mouth, closely f . Albireo.

199 P. XX.—20h. 26m. 43s., N. $48^{\circ} 45' 34''$. a 7, white; b $9\frac{1}{2}$, pale blue; dist. $60''\cdot 7$. In the group on the Swan's tail, close to ω^3 (see above). Not marked on the Globe Atlas.

276 P. XIX.—19h. 40m. 42s., N. $35^{\circ} 45' 49''$. a 8 and b $8\frac{1}{2}$, both white; dist. 15". Between the Swan's neck and the Lyre, about 3° n. of the variable star χ . 5° f . 4, and nearly on the parallel of R. A.

278 P. XIX.—19h. 40m. 49s., N. $34^{\circ} 41' 1''$. a 6, straw-colour; b 8, blue; dist. 39". About 1° n. of χ , in a line to the last object. $2\frac{1}{2}^{\circ}$ p . η , on the parallel of R. A.

429 P. XX.—20h. 54m. 8s., N. $49^{\circ} 56' 14''$. a 6, silvery-white; b $7\frac{1}{2}$, pale grey; dist. $2''\cdot 42$. A close and beautiful double star, suspected binary. 3° n. of the double star 59.

452 P. XX.—20h. 57m. 10s., N. $38^{\circ} 58' 42''$. a 7, deep yellow; b 11, emerald hue; dist. 17". Rather less than midway on a line from δ 1 to ν , which is on the line to Arided. ν 58 is not lettered on the Globe Atlas.

DELPHINUS.

A small constellation, 10° north of the equinoctial; known by its fish-like form, and by its proximity to Aquila. Consists of 18 stars, four of the 3rd mag. and two of the 4th. Rises in May, culminates in August, and sets in November. N. Sagitta and Anser; W. Aquila; S. Aquarius and Antinous; E. Pegasus and Equuleus.

Nebula.

16 H. IV.—R. A. 20h. 16m. 22s., N. D. $19^{\circ} 40' 15''$. A small planet-like nebula, $\frac{2}{3}$ the distance from a to the star 18 in the Arrow's head. On the line from γ to Albireo, and rather more than $\frac{1}{3}$ the distance. "Sir John Herschel, who has figured this object, suggests that the minute stars in close proximity may possibly prove to be satellites."—Smyth. It may be noticed here that H. also expressed the same opinion with reference to the minute companions of certain other stars, and requested the attention of observers particularly to the attendants of ι Ursæ Majoris, α^2 Capricorni, α^2 Cancræ, γ Hydræ, κ Geminorum, and others, as in at least some cases, he supposes, shining by reflected light, and being probably planets attending their suns. It is very difficult to understand how any bodies not self-luminous could become visible at such enormous distances, when the opaque bodies of our own system tax the very highest powers of the telescope; and on the other hand, if these bodies were so near to us as to render them visible, notwithstanding their opacity, their parallax would be readily ascertained.

Cluster.

103 H. I.—20h. 27m. 34s., N. $6^{\circ} 58' 9''$. A globular cluster, small and bright; a mass of very minute stars. One of H.'s test-objects for proving the space-penetrating power of the telescope, 4° s. of ϵ , a little f. the parallel of Declination.

Double Stars.

α 9 Svalocin.—20h. 33m. 21s., N. $15^{\circ} 26' 15''$. a $3\frac{1}{2}$, pale white; b 13, blue; dist. $105''$. A bright star with a distant companion, the lucida,—on the Dolphin's body. a is the p. of the two bright stars to the n. of the asterism.

β 6 Rotenev.—20h. 31m. 13s., N. $14^{\circ} 7' 41''$. a 4, greenish tinge; b 15 and c 12, both dusky; dist. $a-b$ $15''$, $a-c$ $30''$. A most delicate triple star, 1° s. p. a. " a golden-yellow, b greenish-blue; the colours very remarkable."—Bishop.

γ 12.—20h. 40m. 26s., N. $15^{\circ} 38' 33''$. a 4, yellow; b 7, light emerald; dist. $12''$. A very beautiful double star, on the Dolphin's head, the most northerly bright star of the group, nearly 2° f. a .

χ 18.—20h. 49m. 12s., N. $12^{\circ} 3' 11''$. a 6, white; b 14, pale lilac; dist. $55''$. A wide but delicate object, between the Dolphin's head and that of the Little Horse; midway between γ and α Equulei. Not lettered on the Globe Atlas or Maps S. D. U. K.

178 P. XX.—20h. 34m. 46s., N. $10^{\circ} 48' 0''$. a $7\frac{1}{2}$ and b 8, both white; c 16, blue; d 9, yellowish; dist. $a-b$ $14''\cdot3$, $a-c$ $20''$, $b-b$ $0''\cdot7$. An extremely delicate quadruple star. c is a mere glimpse-object, only caught by a fine eye and a good instrument; b is again double—the quadruplicity of this object was discovered by the Rev. W. R. Dawes, 1840. Closely f. ϵ in the Dolphin's tail. ϵ is on the line from a to θ Antin.

D R A C O.

A long straggling constellation, in the polar regions, difficult to recognize. The Dragon's head is under the feet of Hercules, from whence it extends its coils around the pole of the Ecliptic, and the southern portion of the Lesser Bear, while its tail lies on the neck of the Greater Bear, nearly in a line with the two pointers to Polaris. Draco consists of 80 stars, 9 of the 3rd magnitude: α (Thuban), β (Rastaban or Alwaid), δ , η , θ , ι (Ed. Asich), λ (Giauza), ξ (Grummius), γ (Etamin); and 10 of the 4th magnitude. Always visible to Great Britain. N. Ursa Minor; E. Cepheus; S. Hercules; W. Ursa Major and Camelopardus.

Nebulæ.

22 M.—R. A. 15h. 5m. 29s., N. D. $57^{\circ} 30' 19''$. A small bright object on the body of Draco, the brightest of five nebulae in the vicinity. 2° p. ι , and 1° s. of the parallel of R. A. A line from κ , in the Dragon's tail, carried a little n. of α , and produced as far again, will find it, at the spot where it is intersected by a line from η over ι , 2° n. of 219 H. I. An omission of Malby's Globe Atlas, and also of the Maps S. D. U. K.

37 H. IV.—17h. 58m. 38s., N. $66^{\circ} 88' 3''$. A small round nebula, like a star out of focus, in the pole of the Ecliptic, less than half-way from ζ (Nodus Primus) to δ (Nodus Secundus), a little *s.* of the line; exactly on the line from δ to η .

219 H. I.—15h. 2m. 44s., N. $56^{\circ} 17' 9''$. An elongated nebula with a bright centre, small star nearly above it, and a coarse double star in the field. "A very bright resolvable nebula, but none of the component stars to be seen distinctly even with a power of 1000. A perfectly straight longitudinal division in the direction of its major axis, resolvability most strongly indicated towards the nucleus, the major axis, perhaps the minor axis."—Lord Rosse. The major axis trends towards the vertical, just midway on a line from θ Draconis to θ Bootis, a little *n.*, 2° *s.* of 22 M.

764 H. II.—15h. 40m. 53s., N. $59^{\circ} 47' 5''$. A small round nebula, on the body of Draco, one of the group of nebulae *f. u.* $\frac{1}{4}$ of the distance on a line to η .

Double Stars.

α 11 Thuban.—14h. 0m. 44s., N. $65^{\circ} 1' 10''$. *a* $3\frac{1}{2}$, pale yellow; *b* 8, dusky; difference in R. A. 23s.9. *a* is suspected of variability, β is now the lucida, Thuban was the polar star of the Chaldeans 4,600 years ago, being then only $10'$ from the pole; nearly midway between Mizar and Pherkad Major.

β 23 Alwaid.—17h. 27m. 22s., N. $52^{\circ} 24' 0''$. *a* 2, yellow; *b* 10, bluish; diff. in R. A. 29s.8. A fine star with a distant companion, in the eye of Draco, a telescopic double star in the field. β , γ , and ξ , constitute the triangle of bright stars which marks the Dragon's head, *n.* of Hercules.

γ 33 Etamin.—17h. 53m. 28s., N. $51^{\circ} 30' 21''$. *a* $2\frac{1}{2}$, orange tint; *b* 12, pale lilac; diff. in R. A. 9s.7. A fine star with a distant companion, on the crown of the Dragon's head. This star passes near the zenith in the south of England, and is remarkable as being the star by which Bradley and Molyneux discovered the aberration of light in 1725. γ Draconis was the polar star 3,970 years ago, its distance then from the polar point being $3^{\circ} 44' 25''$.

δ 57.—19h. 12m. 31s., N. $67^{\circ} 25' 24''$. *a* 3, deep yellow; *b* $9\frac{1}{2}$, pale red; diff. in R. A., 2s.7. A bright star with a distant and beautiful companion, in the first flexure of Draco. The Nodus Secundus of the Catalogues. Forms a nearly equilateral triangle with β Ceph. and η Cephei.

ϵ 63.—19h. 48m. 41s., N. $69^{\circ} 55' 25''$. *a* $5\frac{1}{2}$, light yellow; *b* $9\frac{1}{2}$, blue; dist. $3''$.1. "*a* 5, yellow; *b* 8, bluish."—Bishop. Variable, fine contrast of colour. A beautiful but difficult double star, nearly $\frac{1}{2}$ the distance from δ to β Cephei. 2° *n.* of the line.

η 14.—16h. 22m. 8s., N. $61^{\circ} 48' 56''$. *a* 3, deep yellow; *b* 11, pale grey; dist. $190''$. Struve has discovered a close and minute companion at $4''$ dist. from *a*,—more than $\frac{1}{2}$ from θ to ζ .

ι 12.—15h. 21m. 56s., N. $59^{\circ} 26' 22''$. *a* 3, orange tint; *b* 9, pale yellow; dist. $117''$. This object precedes several of H. and H.'s nebulae at about 4° dist., on the parallel of Declination with γ Ursæ Minoris.

λ 1.—11h. 23m. 21s., N. $70^{\circ} 4' 34''$. *a* $3\frac{1}{2}$, orange; *b* 12, white; diff. in R. A. 17s.5. On the tip of the Dragon's tail. The line from the pointers (β Urs. and α Ursæ) to Polaris precedes it. A line from Talita, in Ursa Maj. over Al-ula, and less than as far again, will show it. One of a line of stars pointing to the nebulae 81 M. and 82 M., in Ursa Major.

μ 21 Arrakis.—17h. 2m. 33s., N. $54^{\circ} 39' 7''$. *a* 4 and *b* $4\frac{1}{2}$, bright white; dist. $3''$.6. A beautiful double star, binary, period about 600 years; a miniature

of Castor. Rev. W. R. Dawes rates both stars 6th mag. On the Dragon's tongue. On the line from β to θ , and just $\frac{1}{2}$ of the distance.

ν 24.—17h. 29m. 30s., N. $55^{\circ} 16' 45''$. a 5 and b 5, both pale grey; dist. $61''\cdot 9$. A wide pair, in the Dragon's mouth, 3° n. of β , nearly midway between μ and ξ , a little s. of the line.

\circ 47.—18h. 49m. 12s., N. $59^{\circ} 13' 28''$. a 5, orange-yellow; b 9, lilac; dist. $30''$. A neat pair, on the Dragon's neck, in a fine field. A line from μ carried a little n. of ξ , and as far again, will find it.

χ 44.—18h. 23m. 29s., N. $72^{\circ} 40' 40''$. a $4\frac{1}{2}$, pale yellow; b 13, bluish; diff. in R. A. 14s.6. On a line, and nearly midway between β Cephei and γ Ursæ Minoris. ϕ 43, 1° to the s. of χ , has been pronounced a close double star by Struve. $4\frac{1}{2}$ and $6\frac{1}{2}$ magnitudes, $0''\cdot 6$ apart.

ψ 31.—17h. 44m. 20s., N. $72^{\circ} 13' 3''$. a $5\frac{1}{2}$ and b 6, both pearly white; dist. $31''\cdot 3$. A neat pair, on the back of Draco. A line from γ over ξ , and produced about 3 times the distance, will find it—nearly on the parallel of R. A. with χ and γ Ursæ Minoris.

17.—16h. 33m. 3s., N. $53^{\circ} 11' 47''$. a 6, pale yellow; b $6\frac{1}{2}$, faint lilac; c 6, white; dist. $a-b$ $3''\cdot 8$, $a-c$ $90''\cdot 5$. c is Flamsteed's 16. A triple star, p . the head of Draco. A line from γ carried a little s. of β , and produced less than twice as far, will find it.

20.—16h. 55m. 45s., N. $65^{\circ} 14' 41''$. a 7 and b $7\frac{1}{2}$, both white; dist. $0''\cdot 7$. A very close and most difficult double star. H. describes it as "one of the most minute of all the double stars he had found; too small for any micrometer in his possession." Nearly midway between γ Ursæ Minoris and ξ Draconis, p . ζ , a little s. on the line through θ and η .

30. P. XX.—20h. 3m. 44s., N. $63^{\circ} 18' 23''$. a and b both 9, and both white; dist. $3''$. A close double star, nearly midway between δ and η Cephei, nearer the latter, a little s. of the line; 1° s. of the star 64.

39.—18h. 21m. 58s., N. $58^{\circ} 43' 17''$. a 5, pale white; b $8\frac{1}{2}$, light blue; c 7, ruddy; dist. $a-b$ $3''\cdot 2$, $a-c$, $89''\cdot 2$. A triple star, in the Dragon's neck, midway between γ and δ , nearer the former.

40 and 41.—18h. 10m. 8s., N. $79^{\circ} 58' 44''$. a $5\frac{1}{2}$, b 6, both white; dist. $20''$. A fine double star, sometimes called 40 Cephei, *vel* 40 Draconis. Midway between κ Cephei and ζ Ursæ Minoris, a little n. of the line.

"46.—18h. 39m. 50s., N. $55^{\circ} 24' 12''$. a 5, full yellow; b 9, clear blue. A fine contrast."—Webb. Forms the following apex of a triangle, nearly equilateral with γ and ξ .

108 P. XIX.—19h. 15m. 58s., N. $62^{\circ} 57' 48''$. a and b 9, both white; dist. $0''\cdot 5$. A very close object on the Dragon's neck, $4\frac{1}{2}^{\circ}$ s. of δ . π is about 2° s. of δ , and the object sought is about 2° still farther s. and a little p .

147 P. XVII.—17h. 25m. 43s., N. $50^{\circ} 58' 38''$. a 8, pale white; b $8\frac{1}{2}$, ruddy; dist. $3''\cdot 2$. A fine double star, between the Dragon's eye and the right foot of Hercules, about 1° s. of β .

226 P. XVIII.—18h. 44m. 59s., N. $59^{\circ} 10' 43''$. a and b 9, both silvery white; dist. $1''\cdot 7$. A close double star, on the neck of Draco, closely p . the double star \circ 47, which see.

287 P. XVIII.—18h. 55m. 15s., N. $58^{\circ} 2' 22''$. a 7, pale white; b 8, pale red; dist. $0''\cdot 7$. A very close double star, on the neck of the Dragon, 1° s. *f.* \circ , $\frac{1}{2}^{\circ}$ n. of 48. Smith observes concerning the measurement of this star: "As to distance, when it happens to be below $1''$ all measurement, properly so called, ceases, and gives place to simple estimation."

EQUULEUS.

The asterism of the Little Horse, or rather the Horse's Head, is easily found from its position, closely preceding the head of Pegasus. It consists of 10 stars, only one of the 4th magnitude. It may be observed at the same time with Pegasus, rising in May and setting in November. It has the Dolphin close to the N. E., Aquarius to the S., and Pegasus to the W.

Double Stars.

β 10.—R. A. 21h. 16m. 11s., N. D. $6^{\circ} 14' 10''$. a $5\frac{1}{2}$, lucid white; b 13, grey; b 16, dusky; c 14, blue; dist. $a-b$ $35''$, $b-b$ $3''$, $a-c$ $50''$. A severe test-group for a telescope. "As you are testing your telescope, there is a pretty test-object in β Equulei, which is a coarse triple star; and one of the small stars is itself a pretty first-class double star."—H. "On receiving this notice, I soon made out b and c , but it was not until long afterwards that I perceived that minute point of light (b) close to, and nearly $n.$ of b ."—Smyth. On the cheek of the Little Horse, just $n.$ of a line from a (Kitalphar) to ϵ Pegasi.

δ 7.—21h. 7m. 55s., N. $9^{\circ} 27' 46''$. a $4\frac{1}{2}$, topaz-yellow; b 11, pale sapphire; dist. $28''\cdot 2$. δ is followed by three little stars, singularly arranged in a straight line. In the Little Horse's mouth, $4\frac{1}{2}^{\circ}$ $n.$ of a , and $7\frac{1}{2}^{\circ}$ $p.$ ϵ Pegasi, on the parallel of R. A.

ϵ 1.—21h. 52m. 20s., N. $3^{\circ} 46' 46''$. a $5\frac{1}{2}$, white; a $7\frac{1}{2}$, lilac; a , detected closely double, by Struve, and a binary star; dist. $a-b$ $0''\cdot 5$, $a-c$ $11''\cdot 2$. On the Little Horse's forelock. One of two double stars (ϵ and 376 P. XX.), $6\frac{1}{2}'$ $s.$ of χ Delphini, on the parallel of Declination. Not lettered on the G. Atlas, Globe, Maps, or in the *British Association Catalogue*. Smyth has ϵ as Flamsteed's 1, and λ as Flamsteed's 2 (see next object).

λ 2.—20h. 56m. 33s., N. $3^{\circ} 39' 3''$. a 6 and b $6\frac{1}{2}$, both white; dist. $2''\cdot 6$. A very beautiful double star, $p.$ the Little Horse's nose. On a line from a to ϵ Delphini, less than $\frac{1}{2}$ the distance.

355 and 356 P. XX.—20h. 46m. 5s., N. $6^{\circ} 49' 30''$. a $8\frac{1}{2}$ and b $8\frac{1}{2}$, both white; dist. $40''$. A wide double star, between the Little Horse's head and the Dolphin's tail; embraced in Delphinus on the Globe Atlas. $2\frac{1}{2}^{\circ}$ $p.$ λ , on the parallel of R. A., closely $s. f.$ the star 14.

376 P. XX.—20h. 48m. 55s., N. $4^{\circ} 1' 11''$. a $6\frac{1}{2}$, orange tint; b 8, purple; dist. $1''\cdot 8$. A very close and exquisitely beautiful double star, 1° $p.$ ϵ .

ERIDANUS.

This immense constellation lies—with the exception of a few objects—in the southern hemisphere, and winds a serpentine course from Orion to Cetus, and thence southwards to Toucan. It is sometimes called "the River of Orion," because it seems to spring at the feet of the Hunter, near the star Rigel. Only a small portion of the constellation rises to the latitude of London. Eridanus consists of 84 stars— α (Achernar), a splendid star, of the 1st mag., θ and γ of the 2nd, 8 of the 3rd, and 20 of the 4th magnitude. Rises in September, culminates in December, and sets in January. Boundaries of the northern part of the constellation—N. Orion and Cetus; E. Orion and Lepus; and W. Cetus.

Nebulæ.

26 H. IV.—R. A. 4h. 8m. 2s., S. D. $13^{\circ} 5' 6''$. A bright planet-like nebula of a greyish-white colour; an 11th magnitude star in the centre, while the nebula itself stands in a larger and fainter circle of hazy light, as described by Lassell. About $4\frac{1}{2}^{\circ}$ from γ Eridani, in the direction of Rigel, or a little less than $\frac{1}{4}$ the distance.

107 H. I.—3h. 34m. 9s., N. $18^{\circ} 59' 48''$. A pale but distinct nebula, bright in the centre, between the two northern reaches of the River. A line from the double star (to the naked eye) α 38 and 37, carried a little *p.* Zaurack (γ 34), and just as far again, will find it, $9\frac{1}{2}^{\circ}$ *s.* of δ , and $\frac{1}{2}^{\circ}$ *p.* the parallel of Declination.

Double Stars.

β 67 Cursa.—5h. 1m. 13s., S. $5^{\circ} 15' 44''$. *a* 3, topaz-yellow; *b* 12, pale blue; dist. $120''$. A bright star, with a distant companion. A line from α Leporis over Rigel, and $\frac{1}{2}$ the distance beyond, in the direction of π Orionis, will touch it, $3\frac{1}{2}^{\circ}$ *n.* *p.* Rigel.

γ^1 34 Zaurak.—3h. 51m. 44s., S. $13^{\circ} 54' 47''$. *a* $2\frac{1}{2}$, yellow; *b* 10, pale grey; diff. in R. A. 30s. A fine star, with a telescopic companion, pointed to by the central star of the "Bullions" in Orion's belt, and β Eridani, at 3 times the distance beyond. The southernmost of two bright stars γ and δ , which mark the upper reach of the River.

η 3 Azha.—2h. 49m. 51s., S. $9^{\circ} 26' 13''$. *a* 3, pale yellow; *b* 10, cinereous; diff. in R. A. 17s.5. 13° *s.* of Menkar, in the Whale's jaw, and $1\frac{1}{2}^{\circ}$ *f.* 1° *s.* *p.* the group ρ^1, ρ^2, ρ^3 .

τ 4.—3h. 13m. 20s., S. $22^{\circ} 14' 55''$. *a* $3\frac{1}{2}$, light orange; *b* 11, greyish; dist. $150''$. One of a wide group of 9 stars, designated by the letter τ on Bayer's original map, and still retained on the maps and globes. The brightest of the number, they lie nearly in a line east and west.

32.—3h. 47m. 34s., S. $3^{\circ} 1' 19''$. *a* 5, topaz-yellow; *b* 7, sea-green; dist. $6''$.8. A fine double star, the colours beautifully contrasted; between the upper bend of the River and the legs of Taurus. The object is found by drawing the figure of a rhombus with the four stars γ , δ , α , and 32. 32 is at the northern angle, on the side of δ , *p.*, midway between α 38 and 10.

39.—4h. 7m. 59s., S. $10^{\circ} 35' 27''$. *a* 5, full yellow; *b* 11, deep blue; dist. $7''$.1. A delicate double star, under the *n. f.* bend of the River, $7\frac{1}{2}^{\circ}$ *f.* δ , a little *s.* of the parallel. 3° *s.* of the group 38, 40.

40 Keid.—4h. 9m. 8s., S. $7^{\circ} 50' 35''$. *a* 5, orange-colour; *b* $9\frac{1}{2}$, sky-blue; dist. $83''$.9. A wide double star, in the upper bend of the River. "This object is remarkable for its amount of proper motion, being, as far as I yet know, second only to 61 Cygni, and therefore an object of considerable interest."—Smyth. In the group α , 15° *p.* Rigel, and nearly on the same parallel of R. A.

55.—4h. 37m. 6s., S. $9^{\circ} 2' 54''$. *a* $7\frac{1}{2}$ and *b* $7\frac{1}{2}$, both yellowish-white; dist. $10''$.2. A line from Mintaka over β Eridani, and prolonged as far again, will find it.

62.—4h. 49m. 46s., S. $5^{\circ} 23' 14''$. *a* 6, white; *b* 8, lilac; dist. $63''$.8. A wide double star, 3° *f.* β , on the parallel of R. A.

66.—5h. 0m. 5s., S. $4^{\circ} 50' 23''$. *a* 6, white; *b* 11, lilac; dist. $47''$. A coarse double star, close to β , 3° *n.* *p.* Rigel.

98 P. III.—23h. 29m. 52s., N. $0^{\circ} 4' 13''$. α $6\frac{1}{2}$, yellow; δ 9, pale blue; dist. $5''\cdot 9$. A delicate object, under the Bull's chest, close to 10, nearly on the parallel with Mintaka—on the equinoctial. A line from Nath carried a little *n.* of Aldebaran, and prolonged to 5° more than the same distance, will find it.

FORNAX CHEMICA.

One of Lacaille's asterisms, in the space between the southern bend of the River and the belly of the Whale. Inserted for the sake of the following object.

Double Star.

γ^1 .—R. A. 2h. 43m. 52s., S. D. $25^{\circ} 6' 58''$. α 6, pale white; δ 12, light blue; dist. $45''$. A wide but very delicate double star; δ is very faint and difficult, $3\frac{1}{2}^{\circ}$ *s.* of τ^2 Eridani. A line from Menkar (α Ceti) to η Eridani, and produced as far again, will strike τ^2 Erid. Omitted on the Maps S. D. U. K.

GEMINI.

One of the northern zodiacal constellations; consists of 85 stars, easily recognized by the two leading stars Castor and Pollux, in the heads of the Twins. Rises in September, culminates in January, and sets in May. N. Lynx; E. Cancer; S. Canis Minor and Monoceros; W. the Club of Orion and the Legs of Auriga.

Nebulæ.

45 H. IV.—R. A. 7h. 21m. 12s., N. D. $21^{\circ} 11' 3''$. A nebulous star in a small telescope, the southern component of a double star. One of the very remarkable nebulæ of Lord Rosse. A nebulous ring seen on the flat. "A most astonishing object, the star nearer the *n. p.* edge, the breadth of ring less on the *f.* side." January 16th, 1850, "examined with 700 and 900 eye-pieces, both the dark and bright rings unequal in breadth." "This object has been several times examined with the 6-foot telescope, and as yet we have not seen the slightest indication of resolution; the outer ring is seen completely separated from the nucleus surrounding the brilliant point or star; there is a small dark space to the right of the star, which indicates a perforation, similar to those discovered in No. 838, 2050, and others."—Lord Rosse. This object is found 2° *f.* Wasat, and 1° *s.* of the parallel of R. A. Close to the star 63, where a line from ϵ over δ will pass just *n.* of it.

317 H. II. and 316 H. II., 444 H.—7h. 46m. 46s., N. $29^{\circ} 44' 37''$. "An elongated bi-central nebula, approaching to stars."—H. An extraordinary object, a double elliptical ring, incomplete—as if a section of the coils of a spiral—surrounding a double nucleus. "A bright star, between the tails and curved filaments, perhaps an annulus around the two nebulæ, the lower streak seems to reach the filaments of the right-hand nucleus."—Lord Rosse. It will be found $1\frac{1}{2}^{\circ}$ *n.* of the group around ι , more than midway from β to τ , at the *p.* angle of a nearly equilateral triangle with α and β .

Clusters.

1 H. VI. —7h. 30m. 26s., N. $21^{\circ} 52' 32''$. A cluster of large and small stars $12'$ in diameter, 10th to 16th mag. On the back of Pollux, $4\frac{1}{2}^{\circ}$ f. δ , on the parallel of R. A. A line from Pollux to Gomeisa (β Can. Min.) will pass over it at rather more than $\frac{1}{2}$ the distance.

2 H. VI. —6h. 47m. 23s., N. $18^{\circ} 8' 50''$. A fine cluster, triangular shape, composed of very minute stars; on the calf of the right leg of Pollux. A line from Castor over ζ , and 3° beyond, will find it. $\frac{1}{2}^{\circ}$ s. of the line from γ to δ , and $\frac{1}{2}$ of the distance. Marked 2 VII. on the Globe Atlas, and Maps S. D. U. K.

35 M.—6h. 0m. 33s., N. $24^{\circ} 21' 31''$. A splendid cluster. There is a small resolvable nebula (37 H. VI.) lying under the star-dust in the preceding portion of the cluster,—p. the right foot of Castor, in the galaxy. "A marvellously striking object, the field of view $19'$ in diam., is perfectly full of brilliant stars, unusually equal in magnitude and distribution over the whole area."—Lassel. Smyth remarks, that "the stars form curves with a larger star at the root of the curve, like the bursting of a sky-rocket;" and Lord Rosse observes, that "in the exterior stars of some clusters there appears to be a tendency to an arrangement in curved branches." See 5 M. Libræ. A line from μ (Tejat Post) to β Tauri will pass just s. of it, at rather more than $\frac{1}{2}$ of the distance. $\frac{1}{2}^{\circ}$ s. is an extraordinarily condensed field in the Milky Way.

Double Stars.

a 66 Castor.—7h. 25m. 59s., N. $32^{\circ} 17' 0''$. a 3, bright white; b $3\frac{1}{2}$, pale white; c dusky; dist. $a-b$ $4''\cdot 9$. Castor is by far the largest and finest double star in the northern hemisphere; a binary star, of great physical interest. In Bradley's time—from an observation of his recorded 30th March, 1719, it appears "the direction of the double star a of Gemini was parallel to a line through κ and σ of Gemini," and in 1722, October 1st, Pound registers an observation, "A line through the double star a of Gemini, was parallel to another through β and κ ; the southernmost star is the brightest." In 1816, December 20th, Sir J. Herschel observed, "Position of the small star exactly preceding. I made both stars run along the wire repeatedly, from one side to the other, above and below it, and could perceive no deviation from exact parallelism." The line of direction has greatly altered since that period. H. calculated the period of revolution 252 years, and the perihelion passage to occur in 1855; Mr. Hind, 632 years, perh. pass. 1699; Capt. Jacob, period 653, perh. pass. 1703. The perihelion passage certainly did not take place in 1855, and the probability is strongly in favour of Hind's or Jacob's results. Easily found, the most northerly of the two bright stars in the heads of the Twins.

β 78 Pollux.—7h. 37m. 3s., N. $28^{\circ} 21' 2''$. a 2, orange tinge; b $12\frac{1}{2}$, ash-coloured; c $11\frac{1}{2}$, pale violet, and there is a minute attendant as bright as c ; dist. $a-b$ $130''$, $a-c$ $202''$. A coarse triple star in the eye of Pollux—Castor and Pollux are easily known—due n. of Procyon, which is one of the three stars of the 1st magnitude that constitute the great equilateral triangle, viz., Procyon, Betelgeux, and Sirius.

γ 24 Al Hena.—6h. 27m. 2s., N. $16^{\circ} 30' 46''$. a 3, brilliant white; b 13 and c 12, both pale plum-colour; dist. $a-b$ $73''$, $a-c$ $110''$. A wide triple star, on the right foot of Pollux, midway between Wasat and Betelgeux, $\frac{1}{2}^{\circ}$ n. of the line.

δ 55 Wasat.—7h. 12m. 4s., N. 22° 13' 47". *a* 3½, pale white; *b* 9, purple; dist. 7"·2. A very delicate and extremely difficult double star. A line from Nath (β Tauri) carried a little *s.* of ε, and half as far again, will find Wasat.

ε 27 Meboula.—6h. 35m. 37s., N. 25° 15' 40". *a* 3, brilliant white; *b* 9½, cerulean blue; dist. 110"·6. On the line from Wasat to Nath, ½ the distance.

ζ 43 Mekbudd.—6h. 56m. 5s., N. 20° 45' 56". *a* 4, pale topaz; *b* 8, violet; *c* 13, grey; dist. *a*—*b* 90", *a*—*c* 65". A coarse triple star, nearly on the line from Wasat to Al Hena, ½ the distance, a little *n.*

κ 77.—7h. 36m. 20s., N. 24° 43' 9". *a* 4, orange; *b* 10, pale blue; dist. 6". A delicate, and very difficult double star, on the left shoulder of Pollux, ¾ *s.* of β, on the line towards Procyon.

λ 54.—7h. 10m. 20s., N. 16° 47' 3". *a* 4½, brilliant white; *b* 12, yellowish; dist. 10"·3 (7"·1 Bishop). A fine and delicate double star, variable, 5° *s.* of Wasat.

μ 13 Tejat Post.—6h. 14m. 47s., N. 22° 35' 1". *a* 3, crocus-yellow; *b* 11, bluish; dist. 80". A fine object, on Castor's right instep. A line from Castor carried closely to the *n.* of ε, and ½ of the distance beyond, will find it.

π 80.—7h. 38m. 48s., N. 33° 44' 46". *a* 5½, topaz-yellow; *b* 13, bluish; *c* 12, dusky; dist. *a*—*b* 25", *a*—*c* 95". A most delicate triple star. A line from κ over Pollux, and carried 1½ times as far to the *n.*, will touch it.

ι 5.—6h. 19m. 43s., N. 20° 52' 14". *a* 6, flushed white; *b* 8, bluish-white; dist. 32"·2. A fine double star, on the right heel of Castor; the northernmost star of the group near ν. A line from μ to γ will pass over it at ½ the distance.

ο 20.—6h. 24m. 24s., N. 7° 52' 12". *a* 8, topaz-yellow; *b* 8½, cerulean blue; dist. 20"·4. A remarkably fine object, on Castor's left heel, 2° *n. p.* γ, on the line to η, pointed at by Wasat and Mekbudd at less than twice the distance beyond.

φ 38.—6h. 47m. 1s., N. 13° 20' 56". *a* 5½, light yellow; *b* 8, purple; dist. 8". "*a* yellow, *b* blue, dist. 6".—Bishop. A beautiful double star, the colours finely contrasted; suspected binary, variable. On the left ankle of Pollux, 2° *f.* the group ξ¹,², which is pointed at by a line from Pollux over Wasat, and continued 2° more than as far again.

χ 61.—7h. 18m. 59s., N. 20° 31' 32". *a* 7½, deep yellow; *b* 9, yellowish; dist. 60". A coarse double star, which points to a neat pair. *a* 8, blue, and *b* 9, bluish; dist. 6"·5, *n. p.* 61. 61 is 2° *s.* and 2° *f.* δ, and 6° *f.* ζ, nearly on the parallel of R. A. On the line from λ to β, and about ½ the distance.

ψ 63.—7h. 19m. 43s., N. 21° 43' 18". *a* 6, yellow; *b* 10, reddish; dist. 50". A wide double star, on the back of Pollux, 1° *n.* of 61, 2° *f.* δ, a little *s.* of the parallel of R. A. "North of 63 about 40' is a fine pair—*a* 7½, red; *b* 9, blue."—Webb.

HERCULES.

An extensive and very rich constellation, in the northern hemisphere, consisting of 113 stars—8 of the 3rd mag., 11 of the 4th; the rest lower. The figure of Hercules is inverted; the right foot and left knee never set to London. The northern part is distinguished by a trapezium of stars, which terminates at the northern angle by a nearly vertical line of three stars. Rises in March, culminates in June, and sets in October. N. Draco; E. Lyra; S. Ophiuchus; W. Corona Borealis.

Nebulæ.

5 N. Σ .—R. A. 17h. 38m. 48s., N. D. $24^{\circ} 2' 52''$. A small planet-like nebula, 8" in diameter, discovered by Struve; like a star out of focus, having a star 6th mag., reddish colour, in the field, *s. f.*—between the shoulders of Hercules. A line from π over η , and as far again, will find it.

13 M.—16h. 36m. 51s., N. $36^{\circ} 42' 48''$. A first-class resolvable nebula, one of the most superb objects of the kind in the heavens. "A very rich cluster, irregular, figure very large, very gradually more bright in the middle, stars 10th to 15th mag., of which there must be thousands; has hairy-looking curvilinear branches with scattered stars in streaky masses and lines, excessively condensed to a perfect blaze, 7' or 8' in diameter."—H. In the great 6-ft. reflector of Parsonstown it assumes a very different appearance. "May 6, 1850, cluster in Hercules, seems to have a dark streak across, a little above the centre. April 6, 1851, dark lanes seen, which bear some resemblance to the nebula in Andromeda. April 17, 1855, the dark lanes are quite discernible in the finder (a 12-inch achromatic); they do not meet in the centre of the cluster, but to the *s. f.* of it."—Lord Rosse. 13 M. was discovered by Halley, 1714. It is easily found, $\frac{1}{2}$ of the way on a line from η to ζ .

50 H. IV.—16h. 43m. 5s., N. $47^{\circ} 46' 14''$. A fine planet-like nebula, large, round and of a clear blue colour, between the right foot and left knee of Hercules. In a blank region to the naked eye, difficult to find. A line from α Draconis over ι Drac., and less than twice the distance beyond, will find it—about midway from 42 to 52.

92 M.—17h. 11m. 28s., N. $43^{\circ} 16' 40''$. A fine nebula, not so large as 13 M, but with a more brilliant centre; has irregular streamy edges 7' or 8' in diameter, preceded by a 12th mag. star; forms the following apex of an equilateral triangle with η and π . A line from λ over the double star ρ , and produced $\frac{2}{3}$ the distance beyond, will find it. In a rather blank region—has a fine effect on the eye in entering the field of the telescope.

Double Stars.

α 64 Ras Algethi.—17h. 8m. 29s., N. $14^{\circ} 32' 36''$. a $3\frac{1}{2}$, orange; b $5\frac{1}{2}$, emerald; dist. 4''·5. One of the loveliest objects in the whole firmament. a is variable, changing from maximum 3rd mag. to minimum 4th in $60\frac{1}{2}$ days; there are two distant companions *n. f.* 10th and 12th mag., lilac tinge. α Herculis is found from its contiguity to α Ophiuchi, at the extreme south of the constellation.

β 27 Kornefora.—16h. 24m. 25s., N. $21^{\circ} 47' 13''$. a $2\frac{1}{2}$, pale yellow; b 11, lilac tint; dist. 278''. A fine star, with a distant companion, on the left arm of Hercules, in a barren field; the most northerly of the two bright stars β and γ , which lie between the heads of Hercules and Ophiuchus and Corona Borealis. A line from ϵ over μ , and 1° less than half as far again, will find it.

γ 20.—16h. 15m. 59s., N. $19^{\circ} 28' 8''$. a $3\frac{1}{2}$, silvery white; b 10, lilac; dist. 38''·7. A fine double star, on the left arm, 3° *s. p.* β . β , γ , and κ Herculis, with γ Serp. and β Serpentis, form a fine curve, *s. f.* Cor. Bor.

δ 65.—17h. 9m. 29s., N. $25^{\circ} 0' 3''$. a 4, greenish-white; b $8\frac{1}{2}$, grape-red; dist. 25''. A suspected binary star, on the right shoulder. On the line from α to π , the first of a line of bright stars on the right arm of Hercules.

ζ 40.—16h. 36m. 12s., N. $31^{\circ} 50' 41''$. a 3, yellowish white; b 6, orange tint; dist. 1''·2. A fine binary star of great interest, one of the closest and

most difficult of all the double stars, supposed to have passed its perihelion 1821 to 1825, "when it baffled all the efforts of H. and Struve to divide or even elongate it. Struve caught it double in 1826. Since 1832 it has been comparatively easy of vision. In 1840 Rev. W. R. Dawes saw both stars yellow, and that with a magnifying power of 400; they are now readily separated with a 5-foot telescope."—Smyth. ζ is on the left hip of Hercules, one of the stars of the trapezium, 7° s. of ϵ . ζ Herculis revolves in a shorter period than any binary star yet discovered. Mädler's elements are perihelion passage 1829, period 31 years.

η 44.—16h. 38m. 16s., N. $39^\circ 10' 51''$. a 3, pale yellow; b only inferred (Smyth) 8; c 10, dusky; dist. $a-b$ $0''\cdot3$, $a-c$ $14''$. A most difficult test-object. The most northerly of the stars in the trapezium, 7° n. of ζ .

κ^1 and κ^2 γ Marsic.—16h. 1m. 58s., N. $17^\circ 24' 33''$. a $5\frac{1}{2}$, light yellow; b 7, pale garnet; dist. $31''\cdot4$. A beautiful double star, on the left elbow of Hercules, where it forms the central gem of a larger and brighter Corona, than the Corona Borealis, lying s. f. the latter, and formed by the stars β , γ , κ Herculis and γ Serp., and β Serpentis; resembles 61 Cygni, suspected binary. No. 284 and 285 of *Piazzi's Catalogue*.

λ 76 Masym.—17h. 25m. 16s., N. $26^\circ 12' 54''$. a $4\frac{1}{2}$, deep dull orange; b 10, light blue; diff. in R. A. 23s.4. A fine star, with a distant companion. Towards this point of the heavens, according to Argelander, the whole solar system is moving. H. (*Phil. Trans.* 1783, vol. lxxiii. p. 247) was of opinion that the direction of the solar system was to a point in the constellation of Hercules, R. A. 17h. 5m., N. D. $26^\circ 17'$, near the star λ . This conjecture has been confirmed in a remarkable manner by recent observers. Struve differs a little as to the exact point of centralization. "The motion of the solar system in space is directed to a point in the celestial sphere in the right line, which joins two stars of the 3rd mag., π and μ Herculis, at $\frac{1}{2}$ of the apparent distance between these stars, measured from π . The velocity of the motion is such that the Sun with the whole cortège of bodies depending upon him, advances annually in the direction indicated, through a space equal to 1.623 radii of the terrestrial orbit, or 154 millions of miles." λ is on the right arm of Hercules, the second of a line of bright stars, δ , λ , μ , ξ , σ .

μ 86.—17h. 44m. 11s., N. $27^\circ 48' 17''$. a 4, pale straw-colour; b 10, cerulean blue; dist. $30''$. An exceedingly difficult object, in the bend of the arm; the central star of the great curve line of stars in the Hero's right arm.

ρ 75.—17h. 19m. 2s., N. $37^\circ 16' 23''$. a 4, bluish-white; b $5\frac{1}{2}$, pale emerald; dist. $3''\cdot7$ (a greenish-white, b greenish.—Bishop). A very fine double star, discovered by H. in 1781, 2° f. π , a little n. π is at the following angle of the trapezium.

23.—16h. 17m. 45s., N. $32^\circ 38' 28''$. a 6, white; b 9, violet; dist. $36''\cdot2$. A line from ϵ , on the waist of Hercules, carried over ζ , a little n. and as far again, will find it.

37.—16h. 33m. 56s., N. $4^\circ 29' 11''$. a $6\frac{1}{2}$, pale blue; b $7\frac{1}{2}$, blue; dist. $69''\cdot2$. A wide pair, on the right arm of Ophiuchus, but classed in Hercules. A line from α Herculis through κ Ophiuchi, and as far again, will find it.

43.—16h. 39m. 21s., N. $8^\circ 49' 53''$. a 5, rose tint; b 9, light blue; dist. $79''\cdot5$. On the shoulder of Ophiuchus. A line from Yed Prior (δ Oph.) over Marfic (λ Oph.), and as far again, will show it.

46.—16h. 39m. 42s., N. $28^\circ 36' 24''$. a $7\frac{1}{2}$, pale white; b 10, sky-blue; dist. $5''\cdot1$. A fine object—an equilateral triangle, having a line from ϵ to ζ as its base, will have 46 at its southern apex.

56.—16h. 49m. 30s., N. $25^{\circ} 57' 2''$. a $6\frac{1}{2}$, light yellow; b 13, pale red; c 11, greenish; dist. $a-b$ $15''$, $a-c$ $540''$. "Between a and c are three minute stars, on the parallel with each other; this group forms a severe test for a telescope."—Smyth. Less than $\frac{1}{2}$ the distance from ζ to a .

60.—16h. 59m. 7s., N. $12^{\circ} 55' 46''$. a 5, silvery white; b 12, lilac; dist. $45''-0$. Nearly midway between α Herculis and ι Ophiuchi.

95.—17h. 15m. 46s., N. $21^{\circ} 35' 55''$. a $5\frac{1}{2}$, light apple-green; b 6, cherry-red; dist. $6''$. A beautiful object, singular contrast of colour. A line from ϵ over λ , and continued less than as far again, will find it.

100.—18h. 2m. 22s., N. $26^{\circ} 4' 45''$. a 7 and b 7, both lucid white; dist. $14''$. Nearly 3° due $s.$ of α , and on the same parallel of Declination. α is on the right wrist of Hercules.

110.—18h. 39m. 50s., N. $20^{\circ} 50' 18''$. a 5, pale yellow; b 16, dusky; dist. $55''$. A most delicate but wide double star. "This object was among the tests sent me by Sir J. Herschel for trial, and though the companion was only caught by glimpses, on steady gazing in a darkened field, it is certainly a *minimum visibile* of my telescope" (5.9 aperture).—Smyth. A line from δ Aquilæ over ϵ Aq. and half as far again, will touch it.

"125 and 126 P. XVI.—16h. 28m., N. $17^{\circ} 20'$. a 7 and b 8."—Webb. On a line from γ to a , about $\frac{1}{2}$ of the distance, a little $s.$ of the line.

136 P. XVI.—16h. 31m. 35s., N. $13^{\circ} 57' 49''$. a 7, pale yellow; b 12, bluish; dist. $25''$. A difficult object, in a barren field, between the left hand and the head of Hercules, 9° $p.$ a , a little $s.$ of the parallel of R. A.

200 P. XVII.—17h. 35m. 22s., N. $24^{\circ} 34' 42''$. a $6\frac{1}{2}$, topaz-yellow; b 9, purple; dist. $16''-3$. A suspected binary star, in a group, 7° $f.$ δ , a little $s.$ of the parallel of R. A. On the line from ϵ over λ , and more than $\frac{1}{2}$ beyond.

300 P. XVII.—17h. 50m. 29s., N. $18^{\circ} 20' 55''$. a $7\frac{1}{2}$ and b 8, both lucid white; dist. $2''-5$. A very beautiful double star. A line from ζ carried a little $f.$ δ , and just as far again, will find it.

HYDRA.

An enormously long serpentine constellation in the southern hemisphere, commencing under Cancer, winding south of Leo and Virgo to Libra. Consists of 60 stars, of which α (Alphard) is of the 2nd mag., γ of the 3rd, 11 of the 4th, the rest lower. Rises in November, culminates in February, and sets in May. N. Cancer, Sextans, Crater, Corvus, Virgo, and Libra; W. Monoceros; S. Argo Navis and Centaurus; E. Scorpio.

Nebulæ.

27 H. IV.—R. A. 10h. 18m. 18s., S. D. $17^{\circ} 58' 7''$. A pale nebula of a planetary aspect, from its equable light and colour, as well as from having four attendant stars, somewhat resembling the planet Jupiter, 2° $s.$ of μ , a little $p.$ A line from δ Crateris to ν 4, and less than as far again, will touch μ Hydræ.

68 M.—12h. 32m. 15s., S. $25^{\circ} 52' 45''$. A large round nebula, on Hydra's body, $3'$ broad and $4'$ long. 4° $s.$ and 1° $f.$ β Corvi, on the line from δ Corvi, and half the distance beyond.

Double Stars.

α 30 Alphard.—9h. 20m. 58s., S. $8^{\circ} 4' 29''$. a 2, orange tint; b 10, pale green; dist. $285''$. A fine star with a distant companion. a is suspected variable, Cor. Hydræ. A line from γ Leonis carried 1° p . Regulus, and continued rather less than three times the distance, will find it.

γ 46.—13h. 11m. 34s., S. $22^{\circ} 17' 53''$. a 4, greenish yellow, with a minute purple companion following; dist. $11''$. The central of three nearly equidistant stars, $2\frac{1}{2}^{\circ}$ asunder, on the same parallel of R. A. On the parallel of β Corvi, 12° s . of Spica, and $1\frac{1}{2}^{\circ}$ p .

δ 4.—8h. 30m. 34s., N. $6^{\circ} 10' 50''$. a 4, light topaz; b 9, livid; dist. $210''$. On the snout of Hydra; Castor and Pollux point to it, nearly 15° f . Procyon, 1° n . of the parallel of R. A. The head of Hydra is 15° s . of the Præsepe.

ϵ 11.—8h. 39m. 38s., N. $6^{\circ} 54' 53''$. a 4, pale yellow; b $8\frac{1}{2}$, purple; dist. $3''\cdot 6$. A fine double star, discovered by Struve; binary, period about 450 years. On the head of Hydra, $2\frac{1}{2}^{\circ}$ f . δ , a little n .

θ 22.—9h. 7m. 20s., N. $2^{\circ} 53' 9''$. a $4\frac{1}{2}$, pale yellow; b 12, ash-coloured; dist. $45''$. A wide and very difficult object, on Hydra's neck. A line from δ Leonis carried 1° s . of Regulus, and produced rather more than as far again, will find it, in a blank region.

τ 1.—9h. 22m. 18s., S. $2^{\circ} 10' 43''$. a $5\frac{1}{2}$, flushed white; b $8\frac{1}{2}$, lilac; dist. $64''\cdot 9$. On the preceding part of the body of Hydra, 6° n . of Alphard, a little f .

10.—14h. 38m. 12s., S. $24^{\circ} 47' 58''$. a $5\frac{1}{2}$, pale orange; b $7\frac{1}{2}$, violet; dist. $9''\cdot 8$. A beautiful double star, very low on the horizon, difficult to find, included in the asterism of the Avis Noctua, or Hermit bird of India; formed by Le Monnier in 1776, s . of Libra, 5° p . 20 Libræ (Zuban Al Krara), on the same parallel of R. A. 54 on the Maps S. D. U. K.

15.—8h. 44m. 57s., S. $6^{\circ} 40' 22''$. a $6\frac{1}{2}$, pearly white; b 12 and c 13, both purplish; dist. $a-b$ $40''$, $a-c$ $55''$. A most delicate triple star, in the space between the head of Hydra and the tail of Monoceros. A line from γ Geminorum over Procyon, and produced $1\frac{1}{2}$ times as far, will find it.

17.—8h. 48m. 53s., S. $7^{\circ} 27' 23''$. a $7\frac{1}{2}$ and b $7\frac{1}{2}$, both white; dist. $4''\cdot 5$. A close and beautiful object, 1° f . the last object (15), a little s . of the parallel of R. A.

64 and 65 P. IX.—9h. 16m. 14s., N. $4^{\circ} 4' 31''$. a 8 and b 9, both white; dist. $21''\cdot 6$. A neat double star, at the back of Hydra's neck. A line from δ Leonis carried 1° s . of Regulus, and within 1° of as far again, will touch it, on the line to θ Hydræ, $2\frac{1}{2}^{\circ}$ f . θ , 1° n .

94 P. XIII.—13h. 22m. 20s., S. $22^{\circ} 34' 56''$. a $5\frac{1}{2}$, pale orange-yellow; b 8, greenish; diff. in R. A. 19s.5. A variable star, from 4th to 10 mag., period 494 days. The f . of three nearly equidistant stars, on the parallel of R. A., 12° s . of Spica. A line from β Corvi over ψ and γ Hydræ, and $2\frac{1}{2}^{\circ}$ beyond, will touch it. This star is designated μ Hydræ in the *Bedford Catalogue*, by mistake, as μ 42 is in Hora X., not Hora XIII., preceding, not following the Crater. The star 42, No. 3568, is lettered μ in the *British Association Catalogue*, by Malby's Globe Atlas, and by the Maps of S. D. U. K.; and on the other hand, this variable star designated 94 P. XIII. by the B. A. C. and the Maps S. D. U. K.

108 P. VIII.—8h. 28m. 40s., N. $7^{\circ} 5' 30''$. a 6, pale yellow; b 7, rose tint; dist. $10''\cdot 5$. One of a fine group n . of Hydra's head, 1° n . p . δ , on the line to Pollux and Castor.

159 P. X.—10h. 41m. 0s., S. $14^{\circ} 54' 51''$. a 8, pale white; b 9, light blue; dist. $31''\cdot 5$. Near Crater, 1° *n. p.* ν Crateris. "A guide to a much finer object, a star followed by a pair, 1474 Σ , 10h. 39m., S. $14^{\circ} 21'$ —all 7th to 8th mag., and nearly in a line."—Webb.

160 P. VIII.—8h. 38m. 32s., S. $2^{\circ} 6' 41''$. a 7, silvery white; b 8, smalt-blue; dist. $4''\cdot 9$. A neat double star, 9° due *s.* of ϵ , on the parallel of Declination. ϵ is one of the stars near the eye of Hydra.

LACERTA.

A small asterism, constructed by Hevelius, consisting of 16 stars, between Andromeda and Cygnus. N. Cepheus; S. Pegasus.

Clusters.

75 H. VIII.—R. A. 22h. 9m. 58s., N. D. $49^{\circ} 12' 29''$. A large cluster, 9th to 14th mag., $16'$ in length, followed by a splendid field, in the Lizard's mouth: there is a neat double star in the middle of the group. A line from ξ 17 Cephei carried a little *p.* the star ϵ 23 Cephei, and produced as far again, will find it.

"7.—22h. 24m., N. $49^{\circ} 25'$. Points out a noble field; 4, a 5th mag. star, 1° *s. p.* 7, is a fine object, deep orange, with a blue attendant, in a rich field."—Webb. One of the group of four stars in the northern part of the Lizard.

Double Stars.

2.—22h. 15m. 26s., N. $45^{\circ} 51' 22''$. a 5, pale yellow; b 13, orange tint; dist. $35''$. A delicate double star, on the Lizard's shoulder. A line from δ Cephei over 3 Lacertæ, and as far again, will find it.

8^e.—22h. 29m. 52s., N. $38^{\circ} 56' 12''$. a and b $6\frac{1}{2}$, both white; b 11, greenish; c 10, blue; dist. $a-b$ $22''\cdot 5$, $b-b$ $27''\cdot 8$, $a-c$ $82''\cdot 2$. A fine quadruple star, forming a curve in the Lizard's tail. A line from ϵ Pegasi carried a little *p.* ϵ 24 Pegasi, and 1° more than as far again, will reach it.

10.—22h. 33m. 37s., N. $38^{\circ} 20' 56''$. a $6\frac{1}{2}$, white; b 10, violet; dist. $58''\cdot 9$. A wide object, less than 1° *s. f.* the last object. 10 is 9° nearly due *n.* of η 44 Pegasi.

16.—22h. 50m. 14s., N. $40^{\circ} 53' 3''$. a 6, bright white; b 5, pale blue; c $9\frac{1}{2}$, reddish; dist. $a-b$ $25''$, $a-c$ $64''$. A triple star, very difficult from the minuteness of b . On a line from α Andromedæ to 12 Lacertæ, $\frac{1}{3}$ of the distance, $1\frac{1}{2}^{\circ}$ *p.* and 1° *s.* of α Andromedæ.

65 P. XXII.—22h. 13m. 1s., N. $37^{\circ} 5' 12''$. a $6\frac{1}{2}$, pale white; b 9, livid; dist. $15''\cdot 2$. A neat double star, on the top of the Lizard's tail. 1 and 65 form a double star to the naked eye; $4\frac{1}{2}^{\circ}$ *n.* and 2° *f.* π^1 and π^2 Pegasi.

LEO.

A first-class constellation for the Astronomical Observer, in the northern hemisphere; one of the signs of the Zodiac. Consists of 95 stars: α Regulus, 1st mag.; β Denebola and γ of the 2nd; δ , ζ , and θ , of the 3rd; easily recognized. The principal stars resemble a left-hand reaper's sickle placed vertically, with Regulus in the handle. Rises in November, culminates in March, and sets in June. N. Leo Minor; E. Virgo; S. Crater and Sextantis; W. Cancer.

Nebulæ.

13 H. I.—R. A. 10h. 58m. 54s., N. D. $0^{\circ} 41' 33''$. A large, bright, elongated nebula, well defined, *p.* Leo's hind paws, No. 818 H. closely *f.* the star 62. The object is 7° due *s.* of χ , on the parallel of Declination.

18 H. I.—10h. 41m. 8s., N. $13^{\circ} 20' 9''$. Two large faint nebulae, *s. p.* and *n. f.* each other, on the line from Regulus to Denebola, 10° *f.* and 1° *n.* less than midway. In a group of nebulae in the *n. f.* is a neat but minute double star, $\frac{1}{2}$ the distance from ρ to δ . 1° *s. p.* are 95 M. and 96 M.

50 H. II.—11h. 9m. 47s., N. $18^{\circ} 46' 52''$. A round whitish nebula, well defined, with a bright centre, on the croup of Leo, midway between δ and θ . 1° *f.* the line of direction, in a group of faint nebulae.

51 H. II.—11h. 8m. 45s., N. $18^{\circ} 44' 50''$. A rather smaller nebula than the last object, closely *p.* it. The two objects form Nos. 845, 846 H.

56 H. I., and 57 H. I.—9h. 24m. 32s., N. $22^{\circ} 5' 24''$. A double nebula, seen as one in a small telescope; higher optical power shows it bi-central, the nebulosities apparently blending into each other, $3'$ long. "March 9th, 1858. A spiral seen in an oblique direction, resolved well, particularly towards the centre."—Rev. Dr. Robinson observing. "Long attention shows I. 57 a very large, faint, round nebula, attached, *n. f.*"—Lord Rosse. In the Lion's lower jaw, $1\frac{1}{2}^{\circ}$ *s.* of λ 4. Marked 57 II. on the Globe Atlas and Maps S. D. U. K.

65 M. and 66 M.—11h. 13m. 6s., N. $13^{\circ} 44' 14''$. "66 M. is a large elongated nebula, with a bright nucleus. It is preceded at about 73s. by another nebula of a similar shape, which is 65 M.; both are in the field at the same time under a moderate power. These inconceivably vast creations are followed exactly on the same parallel, at Δ R. A. 174s., by another elliptical nebula of even a more stupendous character, as to apparent dimensions, and is No. 875 H."—Smyth. 66 M. is found $2\frac{1}{2}^{\circ}$ *n.* of ι 78, which is on the line from χ to β , or $2\frac{1}{2}^{\circ}$ *s.* and 1° *f.* θ . If the above position of 875 H., given by Admiral Smyth, be correct, the Globe Atlas and the Maps S. D. U. K. are in error in placing this nebula 1° *s. f.* 66 M., and about 3m. diff. in R. A. β , θ , and ι , form a nearly right-angled triangle. The right angle at ι , 65 M. and 66 M., are found nearly midway between θ and ι , a little *f.* the line of direction.

95 M.—10h. 36m. 50s., N. $12^{\circ} 24' 7''$. A round, pale and bright nebula, better defined on the southern than on the northern limb, which, as Admiral Smyth observes, occurs also in the great nebula 31 M. About $\frac{1}{2}^{\circ}$ *f.* and nearly on the parallel, a little *n.* is found 96 M., a large round nebula, not well defined, and of a pale white colour. They lie 9° *f.* Regulus, on the same parallel of R. A. A line from σ 9 Virginis over ι 78 Leonis, and produced as far again, will give the position of the nebulae.

Double Stars.

α 32 Regulus.—10h. 1m. 11s., N. $12^{\circ} 37' 34''$. α 1, flushed white; b $8\frac{1}{2}$, pale purple; dist. $175''\cdot 8$. A splendid star—Cor Leonis—the lucida of the constellation, with a faint distant companion; forms a right-angled triangle with Arcturus and Spica—the right angle at Spica.

β 94 Denebola.—10h. 42m. 11s., N. $15^{\circ} 19' 41''$. α $2\frac{1}{2}$, bluish; b 8, dull red; dist. $298''$. On the Lion's tail, pointed at by a line from Cor Caroli over the group in Coma Berenices.

γ 41 Al Gieba.—10h. 12m. 80s., N. $20^{\circ} 31' 35''$. a 2, bright orange; b 4, greenish yellow; dist. $2''\cdot 8$. "One of the loveliest stars in the whole firmament, binary, period about 1,000 years."—Smyth. Bishop calculated it at 252 years. On the Lion's mane, the 3rd of a zigzag line of bright stars vertically arranged, commencing with Regulus.

δ 68 Zozma.—11h. 6m. 55s., N. $21^{\circ} 15' 59''$. a 3, pale yellow; b 3, blue; c 9, violet; diff. in R. A. $a-b$ 4s.9., $a-c$ 2s.9. A fine star, coarsely triple, in a blank field, 5° n. of θ , midway between Regulus and the group of Coma Berenices.

ϵ 17 Australis.—9h. 37m. 47s., N. $24^{\circ} 23' 44''$. a 3, yellow; b 10, pale grey; diff. in R. A. 1s.9. In the Lion's ear, the middle star of the three bright stars in the Lion's head.

ι 78.—11h. 16m. 53s., N. $11^{\circ} 16' 36''$. a 4, fine yellow; b $7\frac{1}{2}$, clear blue; dist. $2''\cdot 5$. A fine object, discovered by Struve, binary, period not ascertained. On the line from Denebola to χ , a little more than half the distance.

μ 24 Rasalas Bor.—9h. 45m. 5s., N. $26^{\circ} 38' 35''$. a 3, orange; b 10, pale lilac; diff. in R. A. 21s. On the Lion's forehead; the northernmost bright star in Leo.

ψ 16.—9h. 36m. 23s., N. $14^{\circ} 38' 16''$. a 6, bright orange; b 10, bluish-white; dist. $260''$. A variable star, with a distant companion. "One of the most fiery-looking variables on our list, fiery in every state from maximum to minimum; really a fine telescopic object, in a dark sky, about the time of its greatest brilliancy, when its colour forms a striking contrast with the steady white light of the 6th mag., a little to the n."—Hind. On the Lion's left fore-knee. A line from ρ 47 carried just s. of Regulus, and produced less than as far beyond, will find it.

ϕ 74.—11h. 9m. 48s., N. $2^{\circ} 38' 28''$. a 5, pale yellow; b $8\frac{1}{2}$, violet; dist. $105''$. Under the hind paw of Leo. A line from Denebola over τ , and half as far again, will show it.

ω 2.—9h. 21m. 13s., N. $9^{\circ} 38' 36''$. a $6\frac{1}{2}$, pale yellow; b $7\frac{1}{2}$, greenish; dist. $0''\cdot 3$. An exceedingly close, and exquisitely beautiful double star, binary; period as calculated by Mädler, $82\frac{1}{2}$ years, perihelion passage in 1849. "First discovered double by H. 1782, who saw the stars hang together with part of the smaller star, as it were emerging from behind the larger."—Smyth. p . the Lion's left paw. A line from Regulus over σ , and half as far again, will find it, 18° due n. of Alpherat.

3.—9h. 21m. 18s., N. $8^{\circ} 46' 36''$. a $6\frac{1}{2}$, pale yellow; b 13, blue; dist. $25''$. A delicate double star, 1° due s. of ω , the last object.

6.—9h. 24m. 53s., N. $10^{\circ} 18' 37''$. a 6, pale rose tint; b $9\frac{1}{2}$, purple; dist. $37''\cdot 6$. A neat double star, in Leo's left fore paw, 1° f. ω , a little n. $1\frac{1}{2}^{\circ}$ due s. of the variable star ξ 5.

7.—9h. 28m. 30s., N. $14^{\circ} 58' 50''$. a $6\frac{1}{2}$, flushed white; b $8\frac{1}{2}$, violet tint; dist. $42''\cdot 6$. A wide and delicate double star. A line from δ over η , and half as far again, will fall short of it by 1° .

9. P. XI.—11h. 6m. 37s., N. $20^{\circ} 52' 11''$. a $7\frac{1}{2}$ and b $7\frac{1}{2}$, both faint yellow; dist. $1''\cdot 2$. A very close and beautiful double star, discovered by Struve, resembling η Coronæ, very close to δ ; a little s. p .

49.—10h. 27m. 57s., N. $9^{\circ} 20' 50''$. a 6, silvery white; b 9, pale blue; dist. $2''\cdot 5$. A close double star, suspected binary. "Close to ζ , and about 8° w. s. w. of Regulus."—Smyth. This appears a mistake in the *Bedford Catalogue*, which is a marvellously accurate work. ζ is in the northern part of Leo, on the Lion's mane. ζ is perhaps a misprint for ρ , which star answers to the description. 49 is 1° s. f. ρ .

54.—10h. 48m. 17s., N. $25^{\circ} 28' 10''$. a $4\frac{1}{2}$, white; b 7, grey; dist. $6''\cdot 2$. (a yellow, b dusky.—Bishop). A beautiful double star to the *n.* of the constellation. A line from β carried 1° *n.* of δ , and produced $\frac{3}{4}$ the distance beyond, will find it.

67 P. X.—10h. 18m. 27s., N. $9^{\circ} 28' 41''$. a 8, white; b $9\frac{1}{2}$, pale blue; dist. $3''\cdot 5$. A neat and delicate double star, on Leo's right shoulder, 2° *p.* ρ , a little *s.* Close to the star 44.

83.—11h. 19m. 56s., N. $3^{\circ} 4' 53''$. a 7, silvery white; b 9, pale rose-colour; dist. $29''\cdot 8$. On Leo's right hind-leg, closely *n.* *p.* τ 84.

88.—11h. 24m. 47s., N. $15^{\circ} 7' 3''$. a 7, topaz-yellow; b 9, pale lilac; dist. $14''\cdot 9$. Nearly midway between β and θ , $\frac{1}{2}^{\circ}$ *s.* of the line, nearer to the former.

90.—12h. 27m. 41s., N. $17^{\circ} 32' 38''$. a 6, silvery white; b $7\frac{1}{2}$, purplish; c $9\frac{1}{2}$, pale red; dist. $a-b$ $3''\cdot 5$, $a-c$ $58''\cdot 8$. A fine triple star, at the root of Leo's tail, less than half-way from β to δ , and a little *s.* of the line.

91 P. XI.—11h. 23m. 59s., S. $5^{\circ} 58' 26''$. a 6, creamy white; b 11, greenish; dist. $9''\cdot 5$. A fine and delicate double star, in a barren field, nearly 10° *s.* of τ . A line from δ Virginis over η Vir., and carried 4° more than as far again, will touch it, 3° *n.* and $1\frac{1}{2}^{\circ}$ *p.* θ Crateris.

170 P. XI.—11h. 45m. 48s., N. $16^{\circ} 11' 28''$. a $7\frac{1}{2}$, pearl white; b $9\frac{1}{2}$, livid; dist. $35''$. A neat double star, on the brush of Leo's tail, 1° *n.* *f.* β .

179 P. X.—10h. 45m. 8s., N. $8^{\circ} 10' 49''$. a $8\frac{1}{2}$ and b 9, both bluish-white; dist. $11''\cdot 8$. Under Leo's belly. A line from Regulus over ρ , and produced 5° beyond, will find it.

229 P. X.—10h. 57m. 1s., N. $4^{\circ} 21' 59''$. a and b 8, both white; dist. $1''\cdot 3$. A very close and beautiful double star, *p.* the Lion's hind-legs, closely *f.* the star 58. 58 is found by a line from θ over χ , and at less than half that distance beyond.

239 P. X.—10h. 59m. 35s., N. $7^{\circ} 51' 51''$. a 8, topaz-yellow; b $11\frac{1}{2}$, cerulean blue; dist. $8''\cdot 2$. A neat and delicate double star, closely *f.* χ Leonis, a little *s.* A line from Regulus carried a little *n.* of ρ , and as far again, will find χ 63.

LEO MINOR.

A small constellation in the northern hemisphere, very difficult to distinguish. Consists of 53 stars: one of the 3rd, three of the 4th, the rest of lower magnitudes. The northern part never sets to London. Rises in September and sets in July. N. Ursa Major; E. Coma Berenices; S. Leo; W. Lynx.

Nebulæ.

86 H. I.—R. A. 10h. 19m. 42s., N. D. $29^{\circ} 11' 34''$. A bright oval-shaped nebula, with a distinct nucleus, in a field of very minute stars; on the little Lion's haunch. A line from ν Ursæ Maj. to ϵ Leonis, will pass over it at mid-distance.

88 H. I.—10h. 55m. 51s., N. $28^{\circ} 41' 53''$. An elongated nebula, with a faint indication of a nucleus, and also of resolvability, No. 810 H. In a group of nebulae situated $\frac{1}{2}$ the distance from ν Ursæ Maj. to γ Leonis, $\frac{1}{2}^{\circ}$ *s.* of the line.

200 H. I.—8h. 44m. 13s., N. $33^{\circ} 55' 10''$. A large bright elliptical nebula, with a splendid centre, "very beautiful, 8' long and 3' broad."—H. A line from λ Ursæ Maj. over 38 Lyncis, and half as far again, will find it, in a

confusing peninsula, which runs out of Leo Minor down between the Lynx and the Crab. A little *n. p.* the group $\sigma^1, \sigma^2, \sigma^3$, in Cancer, placed within the boundaries of the constellation of Cancer, on the Globe Atlas.

362 H. II.—10h. 43m. 50s., N. $28^\circ 41' 20''$. A faint, round, pale nebula, between the stars 44 and 45. A line from η Leonis over γ Leonis, and produced to ν Ursæ, will pass over it, just $\frac{1}{2}$ from ν Ursæ to η Leonis; pointed at by η Leonis and γ Leonis.

Double Stars.

7.—9h. 22m. 33s., N. $34^\circ 14' 53''$. *a* 6, bluish-white; *b* 11, livid; dist. $55''$. A wide and very difficult double star, $2\frac{1}{4}^\circ$ *f.* 40 Lyncis, and 1° *s.* 38 and 40 Lyncis, ι and κ Ursæ, together with λ and μ Ursæ, form three pairs of wide double stars to the naked eye, at the angles of an equilateral-triangle. 38 and 40 Lyncis, are the most southerly pair of the trio.

37.—10h. 31m. 7s., N. $32^\circ 40' 36''$. *a* 4, yellowish-white; *b* $7\frac{1}{2}$, pale grey; *c* 13, reddish; *d* 12, violet-tint; diff. in R. A. *a*—*b* 21s.9, *a*—*c* 10s.9, *a*—*d* 18s.2. A fine star, with three distant companions. A line from Regulus over γ Leonis, and carried 2° less than twice as far, will touch it.

LEPUS.

A small asterism, in the southern hemisphere, under the legs of Orion; containing 19 stars α (Arneb), β (Nihal), and ϵ of the 3rd magnitude, 9 of the 4th. Rises in October and sets in February.

Nebula.

79 M.—R. A. 5h. 18m. 52s., S. D. $24^\circ 38' 22''$. A bright resolvable nebula, with a blazing centre. "A beautiful cluster of stars, nearly $3'$ in diameter, of a globular construction, and certainly extremely rich."—H. A line from Arneb over Nihal, and a little more than as far again, will reach it, $\frac{1}{2}^\circ$ *f.* the star 406, 5th mag.; or, a line from Saiph (κ Orionis) carried just *f.* Arneb, and as far again, will find it. "In the *n. p.* quadrant is a fine white star, ξ Leporis 7th mag., with a red companion."—Smyth.

Double Stars.

α 11 Arneb.—5h. 26m. 46s., S. $17^\circ 55' 15''$. *a* $3\frac{1}{2}$, pale yellow; *b* $9\frac{1}{2}$, grey; diff. in R. A. 17s.4. A fine star, with a distant companion, on the body of the Hare. A line from γ Orionis to a point *p.* the great nebula, or θ Orionis, by 1° , and as far again *s.*, will find it. On the parallel of R. A. with β Can. Maj., *p.* it by $12\frac{1}{2}^\circ$.

β 9 Nihal.—5h. 22m. 27s., S. $20^\circ 52' 6''$. *a* 4, deep yellow; *b* 11, blue; dist. $210''$. A star with a distant companion, between the fore and hind-legs of the Hare, 3° *s.* and 1° *p. a.* On the line from Saiph (κ Orionis) over Arneb.

γ 13.—5h. 38m. 51s., S. $22^\circ 29' 24''$. *a* 4, light yellow; *b* $6\frac{1}{2}$, pale green; *c* 13, dusky; and a 4th star of the 12th mag., at diff. in R. A. 21s.; dist. *a*—*b* $92''$, *b*—*c* $45''$. A fine star, with three distant companions, in the Hare's hind-foot. A line from Rigel over Arneb, and half as far again, will find it.

ι 3.—5h. 6m. 0s., S. $12^{\circ} 1' 55''$. a $4\frac{1}{2}$, white; b 12, pale violet; dist. $15''$. A fine and delicate double star, in the Hare's left-ear, with a reddish distant star, nearly north, which is Piazzzi's 11, Hora V. A line from Bellatrix over Rigel, and carried 4° beyond, will reach it.!

κ 4.—5h. 7m. 0s., S. $13^{\circ} 6' 3''$. a 5, pale white; b 9, clear grey; dist. $3''\cdot 7$. An exquisitely beautiful, and very close double star, on the Hare's left ear, 1° s. of ι . About 1° n. of μ , and a little p. the line to κ and ι , is a fine scarlet star, R. A. 4h. 45m., S. $15^{\circ} 2'$.

LIBRA.

This constellation is the 7th of the twelve signs of the Zodiac, interwoven in a very confusing manner with the claws of the Scorpion. Consists of 51 stars. Rises in March, culminates in May, and sets in July. N. Serpens; E. Scorpio; S. Hydra; W. Virgo.

Clusters.

5 M.—R. A. 15h. 11m. 41s., N. D. $2^{\circ} 35' 40''$. A first-class resolvable nebula, a grand cluster, a rival of 13 M. in Hercules. "This superb object is a noble mass, refreshing to the senses after searching for faint objects, with outliers in all directions, and a bright central blaze, which exceeds even 3 M. in concentration."—Smyth. "A most magnificent and exceedingly compressed cluster, of a globular form, stars 11th to 15th mag. The condensation is progressive up to the centre, where the stars run together into a blaze, or, like a snow-ball, the scattered rays occupying the whole field."—H. 5 M. is remarkable as having like 13 M. and 35 M. curvilinear forms traced in its stars, which led the Earl of Rosse to suspect that at least some of the great stellar clusters may be of the class of spirals. "In the exterior stars of some of these clusters, there appears to be a tendency to an arrangement in curved branches, which cannot well be unreal or accidental. Nos. 480, 1916 (5 M.), 1968 (13 M.), 1972 (10 M.), are the objects in which I observe that peculiarity noted down in our list of observations."—*Phil. Trans.* 1850. There appears to be very great confusion in the present map-arrangements of the constellations of Libra and Serpens; for instance, 5 Messier in Libra is in the field of the telescope with 5 Serpentis a double star! (see Serpens). 5 M. is pointed at by a line from β Serp. over δ Serpentis, and carried less than once and half as far again, or, it forms a nearly equilateral triangle with the stars ϵ Serp. and μ Serpentis. 5 M. Libræ is embraced within the constellation of Serpens on the Globe Atlas.

19 H. VI.—15h. 9m. 32s., S. $20^{\circ} 32' 24''$. A large compressed cluster of very minute stars, with a vertical curve of 8 stars in the f. part of the field; difficult to find. 12° due s. of β , on the same parallel of Declination.

Double Stars.

α^2 and α^1 Kiffa Australis.—14h. 43m. 25s., S. $15^{\circ} 28' 39''$. a 3 pale yellow; b c, light-grey; dist. $219''$. The star b is α^1 of *Bayer's Catalogue*; both form a fine though wide object, in the southern claw of Scorpio. A line from α Herculis carried a little p. Yed Prior, and just as far again, will show it.

β 27 Kiffa Borealis.—15h. 9m. 44s., S. $8^{\circ} 53' 5''$. a $2\frac{1}{2}$, pale emerald; b 12, light blue; dist. $570''$. One of the very few instances of a solitary star (for

such β really is from the distance of its attendant), being found of a green colour. There are very many instances of secondary or companion green stars, but not the principal. β is midway between α Serpentis and Zuban, but $1^\circ p$. the line; or it is found about midway between μ Serpentis and α Libræ.

γ 38.—15h. 27m. 36s., S. $14^\circ 15' 2''$. a $4\frac{1}{2}$, b , c (colours and magnitude = not given); dist. $a-b$ $2''$, $a-c$ $79''$. "M. Goldschmidt finds a small companion to γ Libræ, about $20''$ dist. There is another and larger star to the $s.$ of γ , $79''$. He remarks that the little star is easily seen by hiding the large star, and thinks the two will be found members of a binary system."—*Intellectual Observer*, June, 1863. The $p.$ of three bright stars equi-distant, and in a line lying between β Libræ and β Capricorni. γ Libræ is nearly midway and a little $p.$ the line from β Lib. to β Capricorni.

ι 24.—15h. 4m. 32s., S. $19^\circ 16' 38''$. a $5\frac{1}{2}$, pale yellow; b $9\frac{1}{2}$, purple; dist. $51''\cdot3$. A wide double star, on the southern claw of Scorpio; a little $f.$ the line from Zuban 20 to β , and about $\frac{1}{2}$ the distance. $13^\circ p.$ and on the parallel of R. A. with β Scorpii.

ξ 15.—14h. 49m. 10s., S. $10^\circ 45' 35''$. a 6 and b 6, both yellowish; c 9, blue; dist. $a-b$ $1''\cdot2$, $a-c$ $7''\cdot4$. This triple star was discovered by Hf. "Very like ζ Bootis."—H. Struve's 1998. There are two stars marked ξ 13 and ξ 15 on the Maps, and also in the *Catalogue of the British Association*, close together in the group, which lies between α and δ , nearer the latter; 18 Dup. is one of the group. *Bishop's Catalogue* is in error in the R. A. of this object; 1850, 15h. 56m. 8s., for 14h. 48m. 38s.

14 P. XV.—15h. 6m. 50s., S. $17^\circ 57' 21''$. a 8, silvery white; b 9, pale grey; dist. $48''$. A coarse double star, on the lower claw of Scorpio, $1\frac{1}{2}^\circ n.f.$ ι , on the line towards ϵ . $9^\circ s.$ and $1^\circ f.$ β , just $s.$ of the Ecliptic.

18.—14h. 52m. 16s., S. $10^\circ 35' 57''$. a 7, straw colour; b 11, grape-red; dist. $20''$. A delicate and beautiful object, under the centre of the balance-beam of Libra, close $f.$ ξ . $\frac{1}{2}$ the distance from a to δ , and $1^\circ f.$ the line.

51.—15h. 56m. 57s., S. $10^\circ 59' 55''$. a $4\frac{1}{2}$, bright white; b 5, pale yellow; c $7\frac{1}{2}$, grey; dist. $a-b$ $1''\cdot2$, $a-c$ $7''\cdot2$. A beautiful triple star. Smyth observes that this star is really ξ Scorpii, though embraced in Libra by Flamsteed. Less than midway on a line from Yed Prior to β Scorpii, $1\frac{1}{2}^\circ p.$ the line. Marked 51 Libræ on the Maps S. D. U. K., but ξ Scorp. on the Globe Atlas.

62 P. XIV.—14h. 15m. 30s., S. $7^\circ 8' 5''$. a 8 and b 8, both silvery white; dist. $5''\cdot2$. A fine object, on the dress of Virgo; within 2° of ι Virginis, on the line from α Libræ.

70 P. XIV.—14h. 17m. 26s., S. $11^\circ 3' 13''$. a $7\frac{1}{2}$, pale yellow; b $9\frac{1}{2}$, greenish; dist. $1''\cdot6$. A beautiful and very difficult double star, $4^\circ s.$ of the last object, $\frac{1}{2}^\circ f.$ A line from τ Virginis carried just $p.$ ι Virg., and less than the same distance, will find it.

91 P. XV.—15h. 23m. 28s., S. $19^\circ 42' 5''$. a $7\frac{1}{2}$, bluish white; b 9, smalt-blue; dist. $11''\cdot8$. A neat object, midway between ι and λ . $8\frac{1}{2} p.$ β Scorpii, and nearly on the parallel.

212 P. XIV.—14h. 49m. 30s., S. $20^\circ 47' 8''$. a 6, straw-colour; b 8, orpiment-yellow; c 16, pale red; dist. $a-b$ $10''\cdot3$, $a-c$ $20''$. A most delicate and beautiful triple star. "The companion c is the very *minimum visible* of my refractor, and not to be caught at all times."—Smyth. A line from a to Zuban 20 will pass over it a little more than half-way.

L Y N X.

A northern constellation, very difficult to recognize and to examine without an equatorial telescope; most of the objects may, however, be fished up by a series of consecutive parallel sweeps with a plain stand. Consists of 44 stars, none exceeding the 4th mag. The greater portion never sets to London. Rises in August, culminates in January, and sets in July. N. Camelopardus; E. Ursa Major and Leo Minor; S. Cancer and Gemini; W. Auriga.

Nebula.

137 H. I.—R. A. 9h. 16m. 5s., N. D. $35^{\circ} 5' 38''$. "A bright nebula on the fore-paws of Leo Minor. A line from ϵ under γ , and through λ Ursæ Majoris, carried 16° beyond, marks its site."—Smyth. "A faint circular nebulosity $3'$ in diameter, surrounds the nucleus."—H. Omitted on the Globe Atlas and Maps S. D. U. K., in the position assigned by the *Bedford Catalogue*, but placed $11\frac{1}{2}^{\circ}$ more to the *n.* and *f.* the star 41 Lyncis. Admiral Smyth observes, "This may be liable to error of identity, if H. mistook 41 Lyncis for 40, but the place here given will be found, I hope, tolerably accurate; at all events, it is No. 593 of H.'s Catalogue of 1830." According to the position given above, the nebula 137 H. I. will be found 1° *f.* the star 40, on the same parallel of R. A. See 40 and 41 Lyncis.

Double Stars.

α 40.—9h. 12m. 50s., N. $35^{\circ} 5' 5''$. "A fine 4th mag. star, with an 8th or 9th mag. companion."—Webb. The Maps and Globes designate this star 40, and assign no Greek letters to any of the stars in the Lynx; the *Catalogue of the British Association*, and the *Catalogue* of the Rev. Dr. Robinson, of Armagh, describe it " α 40 Lyncis α " (the lucida of the Lynx); the Maps, Globes, and the Rev. Mr. Webb, in "Celestial Objects," describe it as a double star; but Admiral Smyth (*Bedford Catalogue*, under 39 Lyncis) affirms " α 40 Lyncis is decidedly a single star." α 40 Lyncis is easily found, the southernmost of a wide pair to the naked eye, see 38. A line from θ in the Bear's snout to the wide pair ι , κ Ursæ Majoris, and as far again, will point on the line 38 and 40 Lyncis.

4.—6h. 10m. 4s., N. $59^{\circ} 25' 32''$. a 6 and b $7\frac{1}{2}$, both white; dist. $1''$. A very close and exceedingly delicate double star, on the upper part of the Lynx's snout. A line from Capella carried 1° *p.* δ Aurigæ, and half as far again, will find it. δ Aurig. is at the apex of a triangle of stars α , β , δ , and is a pointer to this and the three following objects.

5.—6h. 15m. 1s., N. $58^{\circ} 29' 14''$. a 6, orange-tinge; b 13, blue; c 9, pale garnet; dist. $a-b$ $25''$, $a-c$ $96''$. A fine triple star near the eye of the Lynx, within 1° *s.* *f.* the star 4. A line from Capella over δ Aurig., and half as far again, will touch it.

12.—6h. 34m. 18s., N. $59^{\circ} 34' 26''$. a 6, white; b $6\frac{1}{2}$, ruddy; c $7\frac{1}{2}$, bluish; dist. $a-b$ $1''\cdot6$, $a-c$ $8''\cdot9$. A very fine triple star, at the root of the Lynx's left-ear, closely *f.* 174 P. VI. Lyncis. Binary, period about 700 years. *f.* 4, a little *n.* of the parallel of R. A.

14.—6h. 41m. 10s., N. $59^{\circ} 36' 11''$. a $5\frac{1}{2}$, golden-yellow; b 7, purple; dist. $1''$. A very close double star, under the Lynx's ear, $1^{\circ} f.$ 12, a little n .

19.—7h. 11m. 36s., N. $55^{\circ} 32' 6''$. a 7, white; b 8 and c 8, both plum-colour; dist. $a-b$ $14''\cdot 8$, $a-c$ $215''\cdot 2$. A coarse triple star, difficult to find, $4\frac{1}{2}^{\circ}$ due s . of the group on the neck of the Lynx. A line from θ Ursæ Majoris to δ Aurigæ will pass over it at more than $\frac{2}{3}$ of the distance.

20.—7h. 11m. 54s., N. $50^{\circ} 23' 53''$. a and b both $7\frac{1}{2}$, and both silvery white; dist. $15''\cdot 2$. About midway between Talita and β Aurigæ, $2^{\circ} n$. of the line, 5° due s . of 19.

38.—9h. 10m. 26s., N. $37^{\circ} 22' 28''$. a 4, silvery-white; b $7\frac{1}{2}$, lilac; dist. $2''\cdot 8$. A close and delicate object, in the space between the hind part of the Lynx and the head of Leo Minor. 38 and 40 make a wide double star, the uppermost of the southern pair of the triangle of wide double stars to the naked eye.

39.—9h. 13m. 17s., N. $50^{\circ} 7' 0''$. a $6\frac{1}{2}$, lucid-white; b 9, sapphire-blue; dist. $6''\cdot 2$. On the Greater Bear's left fore-leg, though hooked into the Lynx. $2\frac{1}{4}^{\circ} s. p.$ θ Ursæ M., nearly midway between θ and κ Ursæ Majoris.

41.—9h. 19m. 48s., N. $46^{\circ} 11' 33''$. a $6\frac{1}{2}$ and b $8\frac{1}{2}$, both bluish; dist. $86''\cdot 8$. A wide double star, under the Bear's fore-feet, n . of the Lesser Lion's head. A line from κ to λ Majoris will pass over it a little n ., at $\frac{1}{3}$ the distance. 41 appears to have been mistaken for 40, by the constructors of the Globe Atlas and Maps S. D. U. K., for the nebula 317 H. I. has been wrongly placed, following the former instead of the latter. See nebula 317 H. I.

131 P. VIII.—8h. 33m. 51s., N. $49^{\circ} 20' 46''$. a $8\frac{1}{2}$ and b $8\frac{1}{2}$, both white; dist. $9''\cdot 8$. A neat double star, $4^{\circ} p.$ ι in Ursa Major., a little n . of the parallel of R. A. Wrongly embraced in Ursa Major on the Globe Atlas.

174 P. VI.—6h. 32m. 55s., N. $59^{\circ} 34' 29''$. a $7\frac{1}{2}$, bright white; b 10, blue; dist. $4''$. A delicate double star, discovered by Struve, near the Lynx's eye, close to 12. A line from Capella over δ Aurigæ, and $\frac{2}{3}$ the distance beyond, will find it.

"958 Σ .—6h. 34·6m., N. $55^{\circ} 52'$. a 6 and b 6, both white, 1830, is a fine pair which I found yellow, 1852, 1857; dist. $5\cdot 07''$. Omitted in the map, but easily visible with the naked eye; the most easterly of a scattered group."—Webb. $1\frac{1}{2}^{\circ}$ due s . of 13, pointed at by 12 Trip. and 13, at half the distance.

LYRA.

A small but exceedingly rich constellation, in the northern hemisphere, remarkable for its fine stellar and nebular objects; very poorly and imperfectly represented both on the maps and in the catalogues; consists of 21 stars. Vega, the lucida, never sets to the British Isles. Rises in March, culminates in July, and sets in November. N. Draco; E. Cygnus; S. part of Hercules and Vulpecula; W. Hercules.

Nebula.

57 M.—R. A. 18h. 48m. 32s., N. D. $32^{\circ} 51' 49''$. The well-known annular nebula. One of the most singular and beautiful nebular objects in the heavens. The position of the ring is slightly inclined, the perforation in the centre is well seen with a 4-inch aperture, power 250, and the surface has a mottled appearance. "The diameter of the ellipse is $6s\cdot 5$; it has a small star following,

exactly on the parallel of the centre, and distant from the edge rather more than the breadth of the ring."—H. In Lord Rosse's great reflector, it presents a most extraordinary appearance: the ring seems elaborately chased and studded with brilliants, the perforation in the centre not the blank seen in small telescopes, but resembling wisps of sparkling tissue of gems and gold. Easily found, lies nearly midway between β and γ , nearer to β .

Cluster.

56 M.—19h. 11m. 7s., N. $29^{\circ} 56' 43''$. A splendid cluster in a fine field of minute stars, condensed in the centre, but showing symptoms of resolvability in a 4-inch aperture refractor. Less than half-way between β Cygni and γ Lyrae, a little *n.* of the line of direction.

Double Stars.

α 3 Vega, or Wega.—18h. 32m. 20s., N. $38^{\circ} 39' 15''$. a 1, pale sapphire; b 11, smalt-blue; dist. $43''$. A splendid star, with a faint and rather distant companion. "The small star bears more illumination than might be expected from its minuteness."—Dawes. There are two faint double stars in the field, one *n. p.*, the other *s. f.* Many observers rank Vega next after Sirius, but both Sir William and Sir John Herschel place it after Arcturus and Capella. Professor Airy has concluded that the annual parallax of Vega is "much too small to be sensible to our best instruments." The interest of this fine star is considerably heightened from the fact, that owing to the precession of the equinoxes, it will become "the polar star 10,000 years hence, within 5° of the equinoctial pole, and will be gazed at as the gem of the northern hemisphere."—Smyth. Vega is pointed at by the line of three bright stars in Aquila.

β 10 Sheliak.—18h. 45m. 4s., N. $33^{\circ} 12' 24''$. a 3, very white; b 8, pale grey; c $8\frac{1}{2}$, faint yellow; d 9, light lilac; and there is a minute double star in the *s.* vertical; dist. $a-b$ $45''$, $a-c$ $60''$, $a-d$ $71''$. *Variable*. Argelander assigns 6d. 10h. 34m. for its changes from 3rd to 5th magnitude. β and γ form a wide double star to the naked eye, on the line from Vega to Altair.

γ 14 Sulaphat.—18h. 53m. 53s., N. $32^{\circ} 30' 25''$. a 3, bright yellow; b 11, blue; diff. in R. A. 3s.7. γ is suspected also of variability, being now brighter than β .

δ° 11 and δ^1 12.—18h. 49m. 46s., N. $36^{\circ} 43' 46''$. a 4, yellow; b 5, white. A splendid field.

ζ 6, 7.—18h. 40m. 6s., N. $37^{\circ} 27' 56''$. a 5, topaz; b $5\frac{1}{2}$, greenish; dist. $44''$. A wide double star. Suspected of being "double-double," like ϵ 4 and 5, but negatived by H. Forms a triangle with ϵ and Vega, ζ at the southern vertex.

ϵ 4 and 5.—18h. 39m. 51s., N. $39^{\circ} 31' 43''$. a 5, yellow; b $6\frac{1}{2}$, ruddy; c 5 and d $5\frac{1}{2}$, both white; dist. $a-b$ $3''\cdot 2$, $c-d$ $2''\cdot 6$. A double-double star, binary, one of the most interesting stellar objects in the heavens. "The naked eye sees an irregular-looking star near Vega, which separates into two wide stars under the slightest optical aid. Each of these two will be found a fine binary pair, and between the two sets are three minute acolytes. ϵ 4 and 5 resemble each other so closely in magnitude, distance, orbital retrogradation, and proper motions as to afford palpable evidence of their forming a twin system, and a combined rotation around a common centre of gravity may be suspected. It may be roundly stated that b will revolve around a in about 2,000 years; c will take a similar circuit around d in perhaps half that time, and possibly both

double systems may move about the central ones in something less than a million of years; but what is this duration when compared to that astounding unit of time, the *annus magnus* of the whole creation?"—Smyth. ϵ 4 and 5 form with ζ 6 and 7, and Vega, a nearly equilateral triangle to the naked eye, ϵ at the northern vertex.

η 20.—19h. 9m. 9s., N. $38^{\circ} 55' 3''$. a 5, sky-blue; b 9, violet; dist. $28'' 3$. A neat double star, f . at about 90s. by an open pair. η is one of Smyth's test-objects for a moderate telescope; $9\frac{1}{2}'' f$. Vega, a little n . of the parallel of R. A. η is the northernmost of a wide pair to the naked eye.

ν^1 8.—18h. 44m. 44s., N. $32^{\circ} 39' 35''$. a 6, pale yellow; b 13, bluish; c 11, pale blue; d 15, blue; dist. $a-b$ $35''$, $a-c$ $58''$, $c-d$ $12''$. A very delicate and difficult quadruple star, $1^{\circ} s$. of β , nearly on the parallel of Declination.

8 P. XIX.—19h. 3m. 12s., N. $38^{\circ} 42' 56''$. a $7\frac{1}{2}$, yellowish; b $9\frac{1}{2}$, pale white; dist. $1'' 4$. A very close and delicate double star, " f . Vega, on the eastern parallel at 5° distance."—Smyth. As an instance of the uncertainty of the distances of objects on maps compared with globes, it may be noticed here, that this object is 8° distant from Vega on the Maps S. D. U. K., and 6° on Malby's Globe (1858).

13 P. XIX.—19h. 3m. 53s., N. $37^{\circ} 41' 46''$. a 8, bright yellow; b 11, pale grey; c $9\frac{1}{2}$, greenish; d 12, dusky; dist. $a-b$ $18'' 5$, $a-c$ $74'' 8$, $c-d$ $5''$. A double-double star, on the line from θ to ζ , $\frac{1}{4}$ the distance, nearly on the parallel of R. A. with θ . Not marked on the Globe Atlas.

17.—19h. 2m. 19s., N. $35^{\circ} 17' 24''$. a 6, light-yellow; b 11, cerulean-blue; dist. $3'' 6$. A beautiful object, f . γ by 2° , a little s . of the parallel of R. A.

151 P. XVIII.—18h. 33m. 40s., N. $35^{\circ} 56' 11''$. a 8, pale white; b 9, lilac; dist. $3'' 8$. A very elegant double star, $3^{\circ} s$. of Vega, nearly on the parallel of Declination.

299 P. XVIII.—18h. 57m. 37s., N. $46^{\circ} 44' 45''$. a $5\frac{1}{2}$, white; b 14, blue; dist. $50''$. An open and delicate double star, the most northerly star visible in Lyra. Identical with 16 of Flamsteed and forms the northern apex of a nearly equilateral triangle with Vega and θ . On the line and rather more than midway between ϵ Lyræ and κ Cygni.

MONOCEROS:

The constellation of the Unicorn is very indistinct to the naked eye, having no stars exceeding the 4th magnitude. The position is best known from its following Orion, and lying between Canis Major and Canis Minor. Embraces a portion of the Milky Way, and has some fine objects (31 stars Flamsteed). Rises in October, culminates in January, and sets in April. N. Gemini, Canis Minor, and Hydra; E. Hydra; S. Argo Navis and Canis Major; W. Orion.

Clusters.

2 H. VII.—R. A. 6h. 24m. 5s., N. D. $5^{\circ} 2' 16''$. A brilliant compressed cluster, 7th to 14th mag. stars, branching out from a centre; visible to the naked eye. In the field with the star 12, 5th mag.; on the lower jaw of the Unicorn. A line from Mintaka (the upper star in Orion's belt) to Gomeisa (β Canis Minoris), will pass over it about midway; or, a line from Heka, in Orion's head over

Betelgeux, and about 2° farther, will touch the star 8, the cluster follows by 2° , a little *n.* This cluster is described by H. as "winding lines around 12 Monocerotis."

22 H. VI.—8h. 6m. 54s., S. $5^\circ 23' 33''$. "A superb cluster, which fills the whole field, stars 9th, 10th, 13th mag., and none below, but the ground is singularly dotted over with infinitely minute points."—H. It embraces several delicate pairs, and a neat double star (see below). On the Unicorn's flank, difficult to find. A line from the group ξ^1 and ξ^2 in the left foot of Pollux, through the group δ^2 and δ^3 *s. p.* Procyon, and carried as far again, will find it.

27 H. VI.—6h. 44m. 50s., N. $0^\circ 37' 1''$. A condensed cluster in the *Via Lactea*, broken up into three several rich groups, embracing a double star near the centre (see below), difficult to find. A line from Betelgeux carried a little *n.* the star 8 Monocerotis and as far again, will find it.

31 H. VIII.—6h. 41m. 0s., S. $3^\circ 1' 32''$. A fine large cluster, extending beyond the field, $8\frac{1}{2}$ to 11th mag. No. 408 H. "Curiously studded in pairs and triplets."—Smyth. $13\frac{1}{2}^\circ$ due *n.* of Sirius, just midway from Saiph (or Orionis) to Procyon, 1° *s.* of the line.

33 H. VIII.—7h. 1m. 55s., S. $10^\circ 24' 47''$. A loose cluster, under the Unicorn's chest, containing a double star (see below). A line from Sirius over Can. Maj., and a little more than as far again, will find it. Embraced in Canis Major by the Globe Atlas.

34 H. VIII.—7h. 8m. 9s., S. $10^\circ 3' 12''$. A large scattered cluster, in the galaxy. "A very rich field of stars, in which is a brilliant oval mass, bounded by a sapphire-tinted 6th mag. star."—Smyth. $2\frac{1}{2}^\circ$ *f.* 32 and 33 H. V. A line from Sirius carried a little *f.* μ Canis Majoris, and 2° more than as far again, will find it. Marked 34 VII. on the Globe Atlas.

50 M.—6h. 56m. 23s., S. $8^\circ 8' 42''$. One of Messier's grand clusters. A mass of small stars, more or less brilliant, 8th to 16th mag., with a red star towards the southern verge; "and there are certain spots of splendour which indicate minute masses, beyond the power of my telescope."—Smyth. $\frac{1}{2}$ the distance between Sirius and Gomeiza (β Can. Min.), 1° *f.* the line of direction.

Double Stars.

8.—6h. 16m. 36s., N. $4^\circ 39' 33''$. *a* $5\frac{1}{2}$, golden-yellow; *b* 8, lilac; dist. $12''\cdot 9$. A fine double star, on the Unicorn's nostril. A line from the group in the head of Orion carried over Betelgeux, and a little more than as far again will touch it. 8 is a pointer to the nebula 2 H. VII.

10.—6h. 21m. 17s., N. $4^\circ 40' 56''$. *a* 6, pale yellow; *b* 9, orange; dist. $72''$. A wide double star, in the cluster 25 H. VIII., on the Unicorn's fore-knee; midway between Sirius and Betelgeux, 2° *p.* the line, close to *g*. "This 6th mag. pale yellow star is the lucida of an elegant group, the galaxy throughout this constellation, well repays the trouble of sweeping."—Webb.

11.—6h. 22m. 16s., S. $6^\circ 56' 52''$. *a* $6\frac{1}{2}$, white; *b* 7 and *c* 8, both pale white; list. *a*—*b* $7''\cdot 2$, *a*—*c* $9''\cdot 6$, *b*—*c* $2''\cdot 8$. "A curious treble star, one of the most beautiful sights in the heavens."—H. 1781,—on the Unicorn's right fore-leg. A line from Sirius to Betelgeux will pass 1° *p.* it, at $\frac{2}{3}$ the distance, or a line from Adalbaran over Bellatrix, and produced 2° more than as far again, will find it. 4° *p.* the star 5, $\frac{1}{2}^\circ$ *s.*, 2° due *s.* of 10, a little *f.* the parallel of Declination.

14.—6h. 27m. 27s., N. $7^{\circ} 40' 33''$. a 6, yellowish-white; b 16, dusky; dist. $10''$. A most delicate double star, a good test-object for the telescope. In the Unicorn's eye. A line from Bellatrix carried 1° s. of Betelgeux, and a little more than as far again, will show it. 22 H. VII. closely follows 14.

15.—6h. 33m. 32s., N. $10^{\circ} 1' 2''$. a 6, greenish; b $9\frac{1}{2}$, pale grey; c 15, blue; dist. $a-b$ $2''\cdot 5$, $a-c$ $15''$. A very delicate triple star. "Really a quadruple star; there are two very minute stars near a , b , c 12, dist. $10''\cdot 8$, and d 11, dist. $40''$. The large star a is yellow, the small one b is blue."—Bishop. In a magnificent stellar field. A line from Bellatrix carried just n. of Betelgeux, and $1\frac{1}{2}$ times as far, will find it. Nearly midway on the line between Betelgeux and β Canis Minoris, but 2° n. of the line. The clusters 5 H. VIII. and 27 H. V. are in the field.

22 H. VI.—8h. 6m. 54s., S. $5^{\circ} 23' 33''$. a $9\frac{1}{2}$ and b 10, both white; dist. $4''$. A minute double star, in a cluster (see above).

27 H. VI.—6h. 44m. 50s., N. $0^{\circ} 37' 1''$. a $8\frac{1}{2}$, pale straw-colour; b $9\frac{1}{2}$, light grey; dist. $15''$. A double star, in the rich field surrounding 15 (see above, 15 and the clusters).

29.—8h. 1m. 48s., S. $2^{\circ} 35' 29''$. a $5\frac{1}{2}$, light yellow; b 18, grey; c 9, pale blue; dist. $a-b$ $30''$, $a-c$ $66''\cdot 9$. A very delicate triple star, on the Unicorn's flank. "The last of the splendid host that adorns the three preceding hours."—Smyth. A pointer to 22 H. VI. (see above). A line from β Can. Min. over Procyon, and carried three times as far, will find it.

33 H. VIII.—7h. 1m. 55s., S. $10^{\circ} 24' 47''$. a 9, yellow; b 12, dusky; dist. $15''$. A double star, in a cluster (see above).

34 H. VIII.—7h. 8m. 9s., S. $10^{\circ} 3' 12''$. a 8 and b $8\frac{1}{2}$, both silvery-white; dist. $21''$. A double star, in a cluster. A sapphire-tinted 6th mag. star in the s. f. quadrant (see above).

50 M.—6h. 56m. 23s., S. $8^{\circ} 8' 42''$. a 8 and b 18, both pale white; dist. $5''$. A close and very delicate double star, in the cluster 50 M. (see above).

58 P. VI.—6h. 12m. 7s., N. $12^{\circ} 20' 49''$. a 8 and b 13, both dull yellow; dist. $20''$. A most delicate double star, followed by a coarse pair. In the group on the handle of Orion's club, midway between Betelgeux and γ Geminorum, 1° f. 74. Marked 56 on Malby's Globe (1858), embraced in Orion on the Globe Atlas.

81 P. VIII.—8h. 21m. 15s., S. $2^{\circ} 0' 58''$. a 7, pale topaz-tint; b 11, violet; dist. $15''$. A delicate double star, less than half-way between Alphard and Procyon, 1° n. of the group at the root of the Unicorn's tail.

104 P. VI.—6h. 19m. 47s., N. $0^{\circ} 31' 56''$. a $7\frac{1}{2}$, topaz-yellow; b and c $8\frac{1}{2}$, both plum-colour; dist. $a-b$ $67''\cdot 8$, $b-c$ $0''\cdot 6$. A coarsely triple star, b and c constitute one of Struve's exquisitely close double stars. In the group midway between the Unicorn's mouth and his knees, f. the upper star in Orion's belt 14° $\frac{1}{2}$ n. of the equinoctial. In the field with 77.

116 P. VII.—7h. 22m. 81s., S. $11^{\circ} 17' 4''$. a 7, yellow; b $9\frac{1}{2}$, violet; dist. $20''$. A delicate double star, a 3rd star c close to the s. vertical, 14th mag., clear blue. A line from β Canis Maj. a little to the n. over Sirius, and twice as far again, will find it.

OPHIUCHUS.

The Serpent Bearer embraces an extensive region on the equinoctial, to the south of Hercules; consisting of 74 stars: α Rasalague, 2nd mag.; β Cheleb, γ , δ (Yed Prior), ϵ , η , π , 3rd mag.; and λ (Marsic) and 8 others of the 4th. Difficult to distinguish, chiefly from the lengthened sinuosities of Serpens. Rises in March, culminates in June, and sets in October. N. Hercules; E. Taurus Poniatowski, and Clypeus Sobieski; S. Scorpio; W. Libra and Serpens.

Clusters.

9 M.—R. A. 17h. 11m. 9s., S. D. $18^{\circ} 22' 31''$. A fine globular cluster, in the galaxy, 3' or 4' in diameter, considered by H. a miniature of 53 M. A capital test-object for proving the space penetrating power of telescopes. "A very large and very bright cluster of excessively compressed stars, the stars are but just visible and are of unequal magnitudes. The large stars are red, the cluster is a miniature of that near Flamsteed's 42 Comæ Berenices."—H. "This fine object is composed of a myriad of minute stars, clustering into a blaze in the centre, and wonderfully aggregated with numerous outliers."—Smyth. On the left shin of Ophiuchus, and $3\frac{1}{2}^{\circ}$ s. and $2\frac{1}{2}^{\circ}$ f. the bright star η . η is easily found by a chain of stars— δ , α , and ϵ Serpentis; δ , ϵ , ζ , and η Ophiuchi.

10 M.—16h. 50m. 4s., S. $3^{\circ} 54' 21''$. A cluster of minute stars, fills two-thirds of the field, the brightest part 4' in diam. "I see no nucleus—a noble object."—H. On the right hip of Ophiuchus. A line from μ Serpentis to Yed Prior (δ Oph.), and produced $1\frac{1}{2}$ times the distance beyond, will find it, 1° p. the star 30.

12 M.—16h. 40m. 13s., S. $1^{\circ} 43' 11''$. "A very rich globular cluster, stars 10th to 16th mag., 3' in diameter, comes up almost to a blaze; has stragglers and lines extending some distance from the most condensed part, a star, 10th mag. in the centre."—H. Placed exactly at the n . and f . vertex of an equilateral triangle formed with δ and ζ .

14 M.—17h. 30m. 31s., S. $3^{\circ} 10' 13''$. A globular cluster of very minute stars. "Very large, 8' or 10' in diameter, the stars so excessively minute as to be discernible; a striking object."—H. On the left-arm of the Serpent Bearer, 5° n. of μ , 16° due s. of α . A line from ϵ Aquilæ in the Eagle's tail, over the remarkable star 70 Oph., and half as far again, will find it.

19 M.—16h. 54m. 16s., S. $26^{\circ} 4' 37''$. A fine insulated globular cluster, pale white, bright in the centre, stars 12th to 18th mag., 3' in diameter; forms a link between 10 M. and 12 M., between the Scorpion's back and the left-foot of Ophiuchus. A little more than $\frac{1}{2}$ the distance between θ in the foot of Oph. and Antares, a little s. of the line.

23 M.—17h. 49m. 0s., S. $18^{\circ} 58' 39''$. A large coarse cluster, fills the whole field. "Announced several minutes by an increased number of stars in the field of the telescope."—H. "About 2° s. is the curious trifold nebula 41 H. IV., with a delicate triple star in the centre, and pretty closely p. this is 20 M., an elegant cruciform group of stars."—Smyth. 2° s. is found 8 M., another of Messier's grand clusters. A line from ζ 1° n. of η , and carried 2° more than as far again, will find it, 23 M. A line from ν over ξ , and as far again towards μ Sagittarii, will find it.

40 H. VI.—16h. 24m. 33s., S. $12^{\circ} 44' 31''$. A large cluster of small stars. "There are fine telescopic stars around it so as to form a cross when the cluster is high in the field."—Smyth. On the Serpent Bearer's right-leg, 3° s. and $1\frac{1}{2}^{\circ}$ p. ζ , in the direction of β Scorpii. ζ is pointed out by δ and ϵ Ophiuchi.

Double Stars.

α 55 Rasalhague.—17h. 28m. 39s., N. $12^{\circ} 45' 37''$. a 2, sapphire; b 9, pale grey; diff. in R. A. 1s.4. A fine star, with a minute companion, on the back of the Serpent Bearer's head, forms a nearly equilateral triangle with Vega and Altair; easily recognized from its proximity to α Herculis.

δ 1.—16h. 7m. 17s., S. $3^{\circ} 20' 41''$. a 3, deep yellow; b 10, pale lilac; dist. 319". A bright star, with a distant companion; the p. of two bright stars close together on the right hand of Ophiuchus, δ (Yed Prior) and ϵ (Yed Post). Pointed at by the bright stars δ , α , and ϵ Serpentis.

η 35.—17h. 2m. 39s., S. $15^{\circ} 33' 25''$. a $2\frac{1}{2}$, pale yellow; b 13, blue; dist. 269". A brilliant star, with a distant companion, pointed at by μ Serp. and ζ Oph., at more than half the distance.

λ 10 Marfik.—16h. 24m. 6s., N. $2^{\circ} 16' 53''$. a 4, yellowish-white; b 6, smalt-blue; dist. 1". A fine binary star, in the bend of the right arm, very close and difficult. "Period of revolution 88 years, perihelion passage 1798."—(Bishop). "Period 95 years, perihelion passage 1791."—Hind.

ρ 5.—16h. 17m. 29s., S. $23^{\circ} 7' 58''$. a 5, pale topaz; b $7\frac{1}{2}$, blue; dist. $3''\cdot 8$. A neat double star, on the right foot of Oph., which rests upon the back of the Scorpion; wrongly marked in Scorpio on the Maps S. D. U. K. 3° n. and 1° p. Antares.

τ 69.—17h. 55m. 43s., $8^{\circ} 10' 36''$. a 5 and b 6, both pale white; c 10, light blue; dist. $a-b$ $0''\cdot 9$, $a-c$ $82''\cdot 7$. A very close and most difficult double star, with a distant companion. "The closest of all my double stars, can only be suspected with 460, but 932 confirms it to be a double star; one-half of the small star seems to be behind the large star."—H., 1783. "In 1835 the star was oblong, and since that time it has gradually opened, and has now become comparatively easy of measurement."—Bishop. Mr. Hind has calculated the period of revolution about 120 years. The most northerly of two bright stars (τ and ν), in the left hand of Oph., resembling—but less bright—"Yed Prior" and "Yed Post," in the right-hand, pointed at by α and β , 2° f. the line.

19.—16h. 40m. 21s., S. $2^{\circ} 18' 37''$. a $6\frac{1}{2}$, pale white; b 10, livid; dist. 22". A delicate double star, under the right arm, 4° f. Marfik, on the same parallel, of R. A. and on the line to γ .

36.—17h. 7m. 1s., S. $26^{\circ} 23' 28''$. a $4\frac{1}{2}$, ruddy; b $6\frac{1}{2}$, pale yellow; c $7\frac{1}{2}$, greyish; dist. $a-b$ $4''\cdot 9$, $a-c$ $193''\cdot 8$. c is again double with a most minute companion in the s. f. vertical. A fine triple or multiple star, a binary system, period unknown, supposed to be physically connected with 30 Scorpii, $12'$ dist. "Revolving in an *annus magnus*, to contemplate the period of which makes the imagination quail."—Smyth. $11\frac{1}{2}^{\circ}$ f. Antares, on the parallel, and about that distance s. of η . 36 is the bright star 3° s. p. θ .

39.—17h. 9m. 47s., S. $24^{\circ} 8' 10''$. a $5\frac{1}{2}$, pale orange; b $7\frac{1}{2}$, blue; dist. $12''$. A beautiful double star, on the great toe of the Serpent Bearer's left-foot, 1° n. p. θ . Near this star appeared the great temporary star discovered by Mæstlin, Kepler's scholar, in 1604; at first surpassing Jupiter in splendour, and even rivalling the brilliancy of Venus, but afterwards became as small as Regulus, and as dull as Saturn, and finally vanished, in 15 months from its first appearance.

53.—17h. 28m. 12s., N. $9^{\circ} 40' 54''$. a 6, greyish; b 8, pale blue; dist. $41''\cdot 3$. A wide double star, at the back of the head of Ophiuchus, 3° s. of a , on the parallel of Declination.

54.—17h. 28m. 8s., N. $13^{\circ} 15' 24''$. a 6, pale straw-colour; b 14, blue; dist. $18''$. On the crown of the head, closely n. of a .

61.—17h. 37m. 47s., N. $2^{\circ} 38' 21''$. a $7\frac{1}{2}$ and b $7\frac{1}{2}$, both silvery-white; dist. $20''\cdot 7$. A neat double star, closely p . γ . 2° s. of the bright star β .

67.—17h. 53m. 53s., N. $2^{\circ} 56' 20''$. a 4, straw-colour; b 8, purple; dist. $54''\cdot 7$. A wide double star, $3\frac{1}{2}^{\circ}$ f. γ , a little n., closely p . γ .

70.—17h. 58m. 37s., N. $2^{\circ} 32' 30''$. a $4\frac{1}{2}$, pale topaz-colour; b 7, violet; ("a deep yellow; b blue."—Bishop); dist. $6''\cdot 8$. One of the most interesting and remarkable binary stars in the heavens. "The alteration that takes place in the angle of position of this double star is very remarkable: Oct. 7th, 1779, the stars were exactly on the parallel, the preceding star being the larger; May 29, 1804 (after giving the angle of position, H. concludes), this cannot be owing to the effect of systematic parallax, which could never bring the small star to the preceding side of the large one."—H. *Phil. Trans.*, 1804. The calculations of Hind and Jacob result in "period of perihelion passage 1806, period of revolution 73 years." "The rings of this star seem to have something peculiar; they are thin and extend farther than in general. N. B.—I always find this star difficult from the above cause."—H. a , β , γ , are pointers for γ , which follows γ on the parallel of R. A. by 5° .

73.—18h. 2m. 51s., N. $3^{\circ} 58' 21''$. a 6, silvery-white; b $7\frac{1}{2}$, pale white; dist. $1''\cdot 4$. A very close star, suspected binary. H. thought that it required a power of 460 to divide it. Mr. Bishop describes it as now easy of measurement. Smyth calls it "a lovely object." $6\frac{1}{2}^{\circ}$ f. β , $\frac{1}{2}^{\circ}$ s. of the parallel of R. A.

88.—P. XVI.—16h. 21m. 31s., S. $7^{\circ} 49' 25''$. a $7\frac{1}{2}$, yellow; b 12, dusky; dist. $5''$. A very delicate double star, on the right thigh, close to ν , less than midway between ζ and ϵ .

94 P. XVII.—17h. 18m. 28s., N. $15^{\circ} 43' 52''$. a 7, brilliant white; b 13, violet tint; dist. $5''$. a is followed by a ruddy star, 8th mag., diff. in R. A. $16s\cdot 5$. 94 is a difficult and a severe test-object, 2° f. and 1° n. of a Hercules.

270 P. XVI.—16h. 55m. 30s., N. $8^{\circ} 38' 56''$. a 7 and b 8, both white; dist. $1''\cdot 5$. A very close double star, on the right shoulder of the Serpent Bearer; pointed at by ι and κ at the same distance beyond.

ORION.

Considered the grandest of all the constellations, not excepting Ursa Major. When Orion culminates in the month of January, from the splendour of its attendant constellations there is then displayed the finest view of the heavens that our northern hemisphere can exhibit; is less extensive and has fewer nebular objects than Ursa Major, but affords a richer mine for the astronomical observer. Admiral Smyth observes that "Orion contains a wondrous universe of bright stars, double stars, clusters and nebulae within itself." The constellation is partly in both hemispheres, being divided by the Equinoctial just above the line of stars which forms the Hunter's belt. Flamsteed reckons 78 stars, of which two are of the 1st mag., four of the 2nd, and three of the 3rd. The

constellation forms a grand quadangular figure, composed of the stars Betelgeux and Bellatrix in the north, Rigel and Saiph in the south, the central and lower parts are filled up by the three brilliants of the belt, and the sword which hangs by it, and indicates the region of the great nebula—an object of unrivalled interest to the observer. The remarkable form of the constellation, and its central portion in the heavens, so splendidly accompanied, render it a well-known and favourite constellation. It rises in October, culminates in January, and sets in May. N. Taurus and Auriga; E. Gemini and Monoceros; S. Lepus; W. Eridanus and Taurus.

Nebulæ.

θ^1 , or 42 Messier.—R. A. 5h. 28m. 38s., S. D. $5^\circ 28' 49''$. The Huyghens nebula situated in the sword or scabbard of Orion. θ^1 is its title in the *Bedford Catalogue*, but this is properly the designation of the principal star in the trapezium, which occupies a nearly central position in the nebula. 42 M. like 31 M., is visible to the naked eye but of inferior brilliancy, though of far greater dimensions; spreads over considerably more than one field of the telescope, and presents generally a dull, patchy, and granulated surface, the brighter parts rising up in bold relief to the eye from a dark ground. The stars scattered over the nebula seem isolated as if seen through its chasms, but it is generally supposed they are less distant. Three faint stars, seen by glimpses, in the dark gulf called the Fish's Mouth, seem however more distant than the nebula. There is a fine cluster north, and a similar one south, which greatly increase the splendour of the field under a low power. The upper group is connected with the trapezium by an irregular chain of minute stars. There is perhaps no object in the whole firmament capable of producing such a profound sensation of wonder and awe on the mind of the observer as this great nebula; the varied appearance it assumes under different optical powers renders it a most difficult object to sketch or describe. Sir J. Herschel, Admiral Smyth, Bond, of America, Lassell, Otto Struve, and others, have given illustrations of it. Lord Rosse, who was the first to "loose the bands of Orion," by showing it to be "a mass of stars," has not supplied any drawing, although the successful sketcher of such extraordinary and difficult objects as 33 M., 57 M., 99 M., and 101 M. "Professor Bond, of Cambridge, is reported to be preparing for publication a lengthy memoir of this magnificent object, embodying the results of fourteen years' observations, latterly made with Alvan Clark's large object glass—18½-inches aperture. The *spiral* structure of the nebula, which has lately been distinctly visible in this glass, and the supposed change in its appearance within the last few years will doubtless be amongst the topics treated of in the Memoir."—*Astronomical Register*, April, 1863. Bond has recently published an excellent map of the great nebula in Orion.

31 H. V.—5h. 28m. 49s., S. $6^\circ 0' 1''$. A wisp of the great nebula, visible in small telescopes as a haze or atmosphere around a star, but in the Rosse Reflector shown as an annular nebula with a perforation through its centre, and some very faint stars glittering within, as if seen through the aperture, and beyond the nebula; has a diameter of about one-tenth of the moon—looks like a star out of focus. In the field of the large nebula with a low power, *n. f.* the Fish's mouth.

34 H. IV.—5h. 34m. 43s., N. $9^\circ 1' 10''$. A small planet-like nebula, with a faint disc, on the back of the Hunter's head; $\frac{1}{3}$ from λ to α , on the line. This object is 365 H. "Rather oval, and of a mottled light."—H.

78 M.—5h. 39m. 50s., N. $0^{\circ} 1' 29''$. "Two bright nuclei surrounded by a nebulosity."—Messier. Just above Orion's left hip; on the equator, $3\frac{1}{2}^{\circ}$ f. δ , a little n. A line from η carried just over ϵ , and nearly as far again, will find it.

Clusters.

24 H. VIII.—6h. 0m. 50s., N. $13^{\circ} 58' 37''$. A small cluster in the left-hand of Orion, of a triangular shape, embracing a coarse double star (see below). A line from ϵ over α , and carried within 2° of as far again, just short of a point midway between ν and ξ , will touch it 1° s. of ν .

25 H. VII.—6h. 4m. 55s., N. $5^{\circ} 29' 2''$. A tolerably rich and compressed cluster of stars, 9th to 16th mag., embracing a double star (see below), under the left shoulder of Orion. A line from Rigel over ζ , and carried 1° more than as far again, will find it, or, a line from the group in the head of Orion over α , and 1° less than as far again. There are two nebulae marked 25 H. VII. on the Globe Atlas, one in Orion and the other in Monoceros, close to each other; both are embraced in Orion on the Maps S. D. U. K., but probably the Engraver finding the difficulty left one without a designation.

362 H.—5h. 28m. 50s., S. $4^{\circ} 26' 25''$. A cluster, in a splendid field, containing a double star (see below), just to the n. of the great nebula.

Double Stars.

α 58 Betelgeux.—5h. 47m. 51s., N. $7^{\circ} 22' 47''$. a 1, orange-tint; b 9, bluish; dist. $160''$. "A most beautiful and brilliant gem, singularly beautiful; in colour a rich topaz; in hue and brilliancy different from any other star I have seen."—Lassell. H. discovered this star to be irregularly variable, being alternately above Rigel and below Aldebaran. On the left shoulder of Orion, the most northerly star of the quadrangular figure of the constellation. Forms a grand equilateral triangle with Procyon and Sirius.

β 19 Rigel.—5h. 8m. 4s., S. $8^{\circ} 21' 35''$. a 1, pale yellow; b 9, sapphire-blue; dist. $9''\cdot 5$. A splendid star, with a faint companion. To some observers the great star has a very decided bluish tinge resembling Vega. In the right-foot of Orion. A line from α through the belt, and $\frac{1}{2}^{\circ}$ less than as far again, will find it.

γ 24 Bellatrix.—5h. 17m. 53s., S. $16^{\circ} 13' 34''$. a 2, pale clear yellow; b 15, grey; dist. $178''$. A fine star, with a distant minute companion, on the right-shoulder. The second bright star to the n. in Orion.

δ 34 Mintaka.—5h. 25m. 6s., S. $0^{\circ} 24' 5''$. a 2, brilliant white; b 7, pale violet, or pale green; dist. $53''\cdot 2$. A beautiful double star, the leader of the brilliants in Orion's girdle, nearly on the equator; the most northerly of the three stars.

ϵ 46 Al Nilam.—5h. 29m. 22s., S. $1^{\circ} 17' 27''$. a $2\frac{1}{2}$, bright white and nebulous; b 10, pale blue; dist. $160''$. A fine star, the central of the bullions of the girdle. The belt is exactly 3° long, or $1\frac{1}{2}^{\circ}$ at either side of ϵ .

ζ 50 Al Nitak.—5h. 33m. 56s., S. $2^{\circ} 1' 1''$. a 3, topaz-yellow; b $6\frac{1}{2}$, light purple; c 10, grey; dist. $a-b$ $2''\cdot 5$, $a-c$ $56''$. A fine triple star, the last and lowest of the three brilliants on Orion's belt. Observed as a double star only by H., 1780, small star c , supposed variable. There is a second star lettered ζ by mistake on the Globe Atlas, but it is properly π^5 8.

θ .—5h. 28m. 38s., S. $5^{\circ} 28' 49''$. a 6, pale white; b 7, faint lilac; c $7\frac{1}{2}$, garnet; d 8, reddish; e 15, bluish; dist. $a-b$ $13''$, $a-c$ $13''$, $a-d$ $16''$, $b-e$ $5''$.

α is the leader of the four stars which constitute the well-known trapezium in the nebula of Orion. As a trapezium it was gazed at for 50 years, when Struve announced it "quintuplex," by the addition of ϵ . Rev. W. R. Dawes sees distinctly with a 5-foot refractor. A sixth star has been added to the group by W. Lassell, Jun. Mr. Lassell (senior), has seen eight stars in the trapezium. Mr. Porro states that he has discovered two new stars *within* the trapezium. A fine $7\frac{1}{4}$ -inch aperture refractor by Cooke, of York, in the possession of Eddowes Bowman, Esq., Victoria Park, Manchester, shows the faint stars δ and f very distinctly, and Mr. Younge's $9\frac{1}{2}$ -inch aperture shows one of Porro's minute stars within the trapezium. It is concluded that these faint stars have only recently become visible, and that both they and the nebula itself are variable. θ^2 , 6th and 7th magnitudes, distant from θ^1 133, is a coarse double star, dist. $52''$.

ι 44.—5h. 49s., S. $6^\circ 0' 1''$, a $3\frac{1}{2}$, white; b $8\frac{1}{2}$, pale blue; and c 1 grape-red; dist. $a-b$ $12''$, $a-c$ $50''$. The nebulous star, 12 H. III., seen in nebula 31 H. V., 5° s. of ϵ . In the field with the trapezium under a low power all the stars in the neighbourhood are nebulous, and will not show a fine star-point even in the best instruments, a proof of their connection with the great nebula, and its enormous extent. "To the n. f. there is another smaller double star, suspected to have similar dark spaces to ι Orionis."—H. "Large triple star to the south of the Orion Nebula, confirmed observation of opening in its atmosphere, also the openings at the double star $s. p.$ "—Lord Rosse.

λ 39.—5h. 27m. 41s., N. $9^\circ 50' 31''$. a 4, pale white; b 6, violet; dist. $4''\cdot 5$. A fine double star, in Orion's ear; the uppermost of the group.

ρ^1 17.—5h. 6m. 13s., N. $2^\circ 41' 53''$. a 5, orange; b $8\frac{1}{2}$, smalt-blue; dist. $6''\cdot 8$. A neat object, in a line with the three stars of the belt, at the distance of double its length from δ .

σ 48.—5h. 31m. 58s., S. $2^\circ 40' 44''$. a 4, bright white; a 11, ash-coloured; b 8, bluish; c 7, grape-red; d $8\frac{1}{2}$, dusky; e 9, white; f 8, pale grey; dist. $a-a$ $12''$, $a-b$ $12''\cdot 5$, $a-c$ $41''\cdot 8$, $a-d$ $211''\cdot 5$, $d-e$ $8''\cdot 5$, $d-f$ $67''$. "A double-treble star, or two sets of treble stars, almost similarly situated."—H. "A very pretty double triple star."—H. "A double quadruple star, with two very fine stars between the sets."—Barlow. Struve with the great Dorpat refractor reckoned 15 stars in the group, while Schröter with his 25-foot reflector could only see 12. Easily found, a little s. of ζ .

τ 20.—5h. 11m. 2s., S. $6^\circ 59' 29''$. a 4, pale orange; b 15, blue; c 12, lilac; dist. $a-b$ $15''$, $a-c$ $20''$. An excessively delicate triple star, $1\frac{1}{2}^\circ$ n., a little f. Rigel.

23.—5h. 15m. 44s., N. $3^\circ 24' 45''$. a 5, white; b 7, pale grey; dist. $32''$. A fine double star in the arm-pit of Orion, $2\frac{1}{2}^\circ$ s. of Bellatrix, a little p. the parallel of Declination.

24 H. VIII.—6h. 0m. 50s., N. $13^\circ 58' 37''$. a $7\frac{1}{2}$ and b $8\frac{1}{2}$, both lucid-white; dist. $2''\cdot 4$. A double star, in a cluster (see above), on the left-hand of Orion, 1° s. f. the star ν .

25 H. VII.—6h. 4m. 55s., N. $5^\circ 29' 2''$. a $9\frac{1}{2}$ and b 10, both pale yellow; dist. $5''$. A double star, in a cluster (see above), 4° s. f. a .

32.—5h. 23m. 33s., N. $5^\circ 50' 40''$. a 5, bright white; b 7, pale white; dist. $1''$. A close and difficult double star. A fine test-object, on Orion's right-shoulder, $1\frac{1}{2}^\circ$ f. γ , a little s. of the parallel of R. A.

33.—5h. 24m. 9s., N. $3^\circ 11' 20''$. a 6, white; b 8, pale blue; dist. $2''$. A close double star, on the right shoulder-blade of Orion. $\frac{1}{2}$ the distance from γ to ζ .

52.—5h. 40m. 44s., N. $6^{\circ} 24' 21''$. a 6, white; b 8, yellowish; dist. $1''.8$. A very close and difficult double star, a fine test-object, $2^{\circ} p.$ and $1^{\circ} s.$ of a , a little $s.$ of the line to γ .

59.—5h. 51m. 24s., N. $1^{\circ} 49' 16''$. a 6, white; b 13, blue; dist. $42''$. A wide and delicate double star. A line from Rigel through ζ , and $\frac{2}{3}$ the distance beyond, a little $s.$, will find it.

78 M.—5h. 39m. 50s., N. $0^{\circ} 1' 29''$. a $8\frac{1}{2}$ and b 9, both white; dist. $45''$. A double star in a cluster (see above), $3\frac{1}{2}^{\circ} f.$ δ , a little $n.$ of the parallel of R. A.

84 P. V.—5h. 18m. 10s., N. $1^{\circ} 47' 58''$. a 8, silvery white; b 10, grey; dist. $2''.6$. This object is closely $n. f.$ ψ^1 25, on Orion's right side, $4\frac{1}{2}^{\circ}$ due $s.$ of γ .

109 P. V.—5h. 22m. 14s., S. $8^{\circ} 29' 17''$. a $7\frac{1}{2}$, pale white; b 10, blue; dist. $20''$. A delicate object. A line from ζ over the Great Nebula, and as far again, will find it.

258 P. IV.—4h. 51m. 5s., N. $1^{\circ} 27' 55''$. a $8\frac{1}{2}$, white; b 9, pale grey; dist. $2''.4$. An exquisite object, closely $p.$ the right knee of Orion, near π^6 . A line from Arneb to Rigel, and as far again, will find it.

278 P. IV.—4h. 55m. 0s., N. $1^{\circ} 24' 35''$. a $8\frac{1}{2}$, silvery white; b 9, pale blue; dist. $13''.7$. A neat double star, on the right knee of the Hunter, in the group with the preceding object, $1^{\circ} f.$ on the parallel of R. A.

362 H.—5h. 28m. 50s., N. $4^{\circ} 26' 25''$. a 6, lucid white; b 9, pale blue; dist. $5''$. A delicate double star, in a cluster, on the sword of Orion, $1^{\circ} n.$ of ι .

"859 Σ .—6h. 0m., N. $5^{\circ} 40'$, and 809 Σ .—5h. 42m., S. $1^{\circ} 28'$, are pairs worth looking for."—Webb.

PEGASUS.

A large and a rather blank constellation, with very few stars visible to the naked eye for so extensive a region. Easily recognized by the large and nearly rectangular figure, called the Great Square, formed by the four bright stars Markab, Scheat, Algenib, and Alpherat in Andromeda (sometimes designated δ Pegasi); consists of 89 stars. Rises in April, culminates in September, and sets in January. N. Cygnis, Lacerta and Andromeda; E. Pisces; S. Pisces and Aquarius; W. Equuleus, Delphinus, Vulpecula and Cygnus.

Nebulæ.

15 M.—R. A. 21h. 23m. 25s., N. D. $11^{\circ} 35' 51''$. "A nebula with a star, its form circular and centre brilliant."—Messier, 1764. "A very bright, very large, irregular cluster, completely insulated. A magnificent globular cluster, comes up to a perfect blaze in the centre, like a protuberance or nipple. It has straggling streams of stars, drawing up as it were to a centre $4'$ or $5'$ in diameter."—H. Between the mouths of the two Horses, equidistant from ϵ Pegasi and δ Equulei, but $2^{\circ} n.$ of the line which joins them. A line from θ over ϵ , and 1° more than half the distance beyond, will find it.

53 H. I.—22h. 30m. 52s., N. $33^{\circ} 40' 10''$. A large elongated nebula, as figured by Lord Rosse, with an opening along the major axis in the central part, and towards the lower side. There are five nebular knots adjacent, suggesting a connection with the principal nebula as a centre, 2172 H. A line from μ just preceding η , and carried 1° less than as far again, will find it. β , η , and μ form a triangle on the $n. p.$ angle of the square.

55 H. I.—22h. 58m. 13s., N. $11^{\circ} 35' 56''$. An elongated spindle-shaped nebula. "Very faint, trending nearly north and south, having a telescopic streak at each end, 4' long by 2' broad; a mere streak, probably a flat ring seen edgewise."—H. In Lord Rosse's 6-ft. reflector, this object becomes a double nebula, the long spindle lying across the coils of a vast elliptical spiral, the latter much fainter, leading to the conclusion that the former is much nearer and that the connection is merely optical. "September 10, 1849, Spirall observed frequently, and by many friends, the drawing given (see *Phil. Trans.* 1850) represents the object with considerable accuracy."—Lord Rosse. This object is 2205 H. The faint ray-nebula only is visible in small telescopes. 3' due s. of Markab, on the same parallel of Declination.

240 H. II.—23h. 56m. 4s., N. $15^{\circ} 22' 28''$. "A bright large nebula, 2' or 3' in diameter."—H. "A decided dark lane runs through it in the direction of its major axis, rather narrow in the centre and spreads out laterally, fading away towards its extremities. I think I see the right-hand side of centre to be composed of stars. It is brighter than the opposite side."—Lord Rosse. 2297 H., 2° p. and 1° n. of the parallel of Algenib, on the line towards Scheat.

Double Stars.

α 54 Markab.—22h. 58m. 1s., N. $14^{\circ} 28' 50''$. a 2, white; b 11, pale grey; diff. in R. A. 17s.2. A fine star, with a distant telescopic companion. One of the stars of the Great Square, at the s. p. angle.

β 53 Scheat.—22h. 57m. 13s., N. $27^{\circ} 21' 0''$. a 2, deep yellow; b 15, blue; dist. 75". A bright star, with a distant companion, one of the stars of the square, at the n. p. angle.

γ 88 Algenib.—0h. 6m. 17s., N. $14^{\circ} 26' 3''$. a $2\frac{1}{2}$, white; b 13, pale blue; dist. 181". One of the square of stars, at the s. f. angle, s. of Alpherat in Andromeda.

ϵ 8 Enif.—21h. 37m. 33s., N. $9^{\circ} 15' 28''$. a $2\frac{1}{2}$, yellow; b 14, blue; c 9, violet; dist. $a-b$ 85", $a-c$ 138". In the mouth of Pegasus, forming a triangle with ζ Pegasi and α Aquarii.

ζ 42 Al Homam.—22h. 34m. 43s., N. $10^{\circ} 7' 40''$. a 3, light yellow; b 13, dusky; dist. 65". A fine star, with a minute companion, 14° f. ϵ , 1° n. of the parallel, nearly 20° due s. of η .

κ 10.—21h. 38m. 31s., N. $25^{\circ} 1' 29''$. a 4, pale white; b 13, purple; dist. 12". A delicate double star on the right fetlock-joint of the Horse, 3° s. of μ Cygni, 16° due n. of ϵ Pegasi.

ξ 46.—22h. 39m. 56s., N. $11^{\circ} 29' 14''$. a 5, pale yellow; b 15, blue; c 12, dusky; dist. $a-b$ 15", $a-c$ 110". A most delicate double star, with a distant companion, nearly 2° n. f. ζ , towards Markab, $\frac{1}{2}^{\circ}$ n. of the line of direction.

π 27.—22h. 3m. 15s., N. $32^{\circ} 31' 4''$. a 5, bright yellow; b 10, blue; c 11, dusky; dist. $a-b$ 74", $a-c$ 185". A star with two minute companions, on the left fore fetlock of the Horse, pointed at by β and η , at somewhat less than twice the distance.

1.—21h. 15m. 50s., N. $19^{\circ} 13' 40''$. a 4, pale orange; b 9, purplish; dist. $36''$.4. A neat double star, suspected variable. A line from α Aquarii, over ϵ Pegasi, and as far again, will find it.

3.—21h. 30m. 59s., N. $5^{\circ} 50' 49''$. a 6, white; b 8, pale blue; dist. 39". Between the nostril of the Horse and the head of Aquarius, one of a group, 3° s. and $1\frac{1}{2}^{\circ}$ p. ϵ . On the line, and 1° more than midway from θ to α Equulei. There is a small double star in the field 8" apart.

20.—21h. 54m. 80s., N. $12^{\circ} 28' 30''$. a $5\frac{1}{2}$, lucid-white; b 14, blue; dist. $35''$. A difficult object, just *n.* the cheek of the Horse. A line from a Equulei over ϵ Pegasi, and rather more than half as far again, will find it.

33.—22h. 17m. 10s., N. $20^{\circ} 10' 0''$. a $7\frac{1}{2}$, lucid-yellow; b 10, blue; c 8, pale grey; dist. $a-b$ $2''\cdot7$, $a-c$ $57''\cdot9$. A very close double star, with a distant companion. Struve first detected a closely double, but it has been seen and measured by Rev. W. R. Dawes with a 5-feet telescope. A little *n.* of the line from β to ϵ , and less than half-way, at the preceding angle of a nearly equilateral triangle with a and β . “33 is the leader of six similar stars, lying in a line.”—Smyth.

37.—22h. 23m. 9s., N. $3^{\circ} 44' 54''$. a $6\frac{1}{2}$ and b $7\frac{1}{2}$, both white; dist. $1''\cdot1$. A very close and beautiful double star, binary, period about 500 years; behind the ear of the Horse, in a group, *f.* the star 30, or it will be found midway between ζ Pegasi and α Aquarii, 1° *f.* the line of direction.

57.—23h. 2m. 42s., N. $7^{\circ} 56' 57''$. a $5\frac{1}{2}$, orange; b 13, greenish; dist. $35''$. A very delicate double star, between the Horse's main and the southern Fish. One of a group which makes the *s. f.* angle of an equilateral with a and ζ . One of a group of four stars which lies midway between Markab and γ Piscium.

216 P. XXIII.—23h. 46m. 5s., N. $11^{\circ} 10' 32''$. a and b both $8\frac{1}{2}$, and both silvery white; dist. $18''\cdot5$. A neat double star, on the Horse's wing. A line from ϵ over ζ and as far again will touch it, or a line from β over τ , and carried twice the distance beyond.

306 P. XXII.—23h. 1m. 0s., N. $32^{\circ} 5' 46''$. a 7, bright white; b $8\frac{1}{2}$, sapphire-blue; dist. $8''\cdot5$. A fine object, forms the northern vertex of an equilateral triangle with β and η .

312 P. XXI.—21h. 45m. 14s., N. $19^{\circ} 11' 43''$. a $6\frac{1}{2}$, white; b 14, blue; dist. $15''$. A most delicate double star, forms the *s.* vertex of an equilateral with ι and κ . On the line from the star 9 to ι , and $\frac{1}{3}$ the distance. 9 is $7\frac{1}{2}^{\circ}$ due *n.* of ϵ , on the parallel of Declination.

PERSEUS.

This fine constellation is situated in the northern hemisphere in a very rich portion of the Milky-Way, where field after field astonishes the observer. The number of stars tabulated by Flamsteed is 59, but the telescopic stars are innumerable. Perseus, in its circuit around the Pole, never sets to Great Britain. It rises in June, culminates in November, and sets, or rather descends, beneath the Pole in April. N. Cassiopea and the Camelopard, E. Auriga, S. Taurus, W. Triangulum and Andromeda.

Nebulæ.

69 H. IV.—R. A. 3h. 0m. 48s., N. D. $30^{\circ} 15' 54''$ “A star, 8th mag., with a fine atmosphere, diameter $12''$ of time, perfectly nebulous, and fading away to nothing, a faint star following.”—H. On the line and just midway from ϵ to ϵ Tauri. A line from α 38 through ζ in the right foot of Perseus and carried less than twice the distance will find it.

76 M.—1h. 33m. 48s., N. $50^{\circ} 54' 11''$. A white elliptical-shaped nebula, trending north and south, situated between four stars, and close to a double

star (see below). 3° *n.* and 1° *f.* the star, ν 51 Persei, which is on the left ank of Andromeda, and is marked ν on Malby's Globe. A line from β Cassiope over θ , and rather more than half as far again, will find it, 1° *n.* of the star Andromeda, which is ϕ Persei.

156 H. I.—2h. 31m. 57s., N. $38^{\circ} 27' 55''$. A pale but distinct, elongated nebula, supposed to be a flat ring, lying obliquely, in a rich field, just *p. t.* the group in the head of Medusa, 2° *n. p.* the star 16, 5th mag., on the line Almaach.

Clusters.

25 H. VI.—3h. 5m. 43s., N. $46^{\circ} 43' 41''$. An extensive cluster, with a compressed centre of about 4' in diameter. "The large stars are arranged in lines like interwoven letters."—H. This object is 290 H., and is found midway between α and κ 27. There is a second 25 H. VI. inserted by mistake, due south.

33 H. VI.—2h. 9m. 41s., N. $56^{\circ} 31' 29''$. A magnificent cluster in the weapon-hand of Perseus. A brilliant mass of stars, 7th to 15th mag. Containing a double star (see below). "In the centre is a coronet or ellipse of small stars over an 8th mag. star. A 7th mag. star following, is handsome from the blackness of the space immediately around it."—Smyth. This blackness extends on both sides of the star, which has the corona over it, and there is a cluster of minute stars beneath; in the dark chasm to the right there is a faint and very minute double star, in apparent solitude, as if seen through and beyond the great cluster, while in the corresponding void on the left of the 8th mag. star there is a very faint double-double star. 33 H. VI. is the larger of the two clusters, which may both be embraced with a low power. This object is visible to the naked eye as a dull patch of light. It is pointed out by two of the bright stars (γ and δ) in the W. of Cassiopea, at twice their distance beyond.

34 H. VI.—2h. 12m. 40s., N. $56^{\circ} 32' 30''$. Another gorgeous group of stars, at about 3' *f.* the last objects, and nearly on the parallel, the clusters are quite distinct; a low power will place both in the field. "One of the central stars is of a fine ruby colour, and a 7th mag. in the *n. f.* is of a pale garnet tint, with two sparkling but minute triplets south of it."—Smyth.

34 M.—2h. 33m. 21s., N. $42^{\circ} 9' 17''$. A fine but irregular cluster of stars, 9th, 10th, and 11th mag., grouped into wide pairs, coarsely scattered, fills the whole field. H. describes it as a coarse cluster of large stars of different sizes, between the head of Medusa and the right foot of Andromeda, forms the *p.* angle of an equilateral, with Algol and κ 27. Omitted on the Globe Atlas.

60 H. VII.—4h. 0m. 1s., N. $49^{\circ} 8' 44''$. An oval group of minute stars, in a very rich neighbourhood. There is "a group to the *n. f.* magnificently radiated, and formed like a badge of knighthood."—Smyth. 11° *f. a.*, a little *s.* of the parallel of R. A., between λ and μ nearer to λ .

227 H.—2h. 23m. 49s., N. $54^{\circ} 55' 36''$. A scattered cluster, discovered by H., stars 9th to 15th mag., preceded by several outliers, one of which has a red tinge, on the weapon-arm of Perseus, 3° *f.* the great cluster. A little *n.* of the parallel of R. A.

Double Stars.

α 33 Marfak.—3h. 14m. 41s., N. $49^{\circ} 22' 46''$. α $2\frac{1}{2}$, brilliant lilac; b 9, cinerous; dist. 75". A fine star with a distant companion, on the right side of Perseus. Pointed at by Mirach and Almaach.

β 26 Algol.—2h. 59m. 22s., N. $40^{\circ} 25' 59''$. a 2 to 4, whitish; b 11, purple; dist. $55''$. One of the most remarkable of the variable stars, varying from the 2nd to the 4th mag., in a few seconds less than 2 days, 20 hours, and 49 minutes, the period of actual increase occupying no more than 7h., the minimum only 18m., so that it usually appears a star of the 2nd magnitude. Algol is on the head of Medusa, and lies at the p . angle of an equilateral triangle, formed by the stars β , δ , ϵ , Persei. The phenomenon of variable stars constitutes one of the greatest mysteries in observational astronomy. Sir W. Herschel offered a solution of the difficulty, by supposing "rotations or changes in the inclinations of the axes, of bodies much flattened by quick rotatory motions, or surrounded by rings like Saturn." Admiral Smyth suggested, "these singular appearances are accounted for by supposing the body to revolve on an axis having parts of its surface non-luminous." Goodricke, in 1782, attempted to explain the periodic variations of certain stars, by supposing the intervention of some large opaque bodies revolving around the variable star as its central sun. The theory of Bessel is "that stars whose variable motions become sensible, when examined with the most perfect instruments, are parts of systems which are limited to spaces small in comparison with the great distances of the fixed stars from each other. The physical difficulty of a variation in the proper motion is satisfactorily (?) met by the hypothesis of dark stars." Mädler affirms Bessel's theory. "A dark body might be a central body. It might, like our sun, be only surrounded in its immediate vicinity by dark bodies—such as our planets. The movements of Procyon and Sirius, pointed out by Bessel, constrain (?) the assumption, that there are cases in which luminous bodies are satellites to dark masses."—Humboldt. "We shall assuredly know more about the apparent irregularities of the *stellæ versatiles*, and trammel them with fixed laws; but we are yet to ascertain whether their periodic perturbations are owing to Boulliaud's bodies, with opaque regions on their surface—to having been flattened like millstones (*Cycle* i. p. 273) with Maupertius—to their being the effect of total or partial eclipses, as Pigott thought, occasioned by the intervention of some obscure orb—that the variations may be due to Arago's cosmical clouds under revolutionary influence; or whether, with Mr. Norman Pogson, they are down-right double stars, semi-luminous and non-luminous, in orbital recurrence, of the very same phenomena in the same times. *Nous verrons!*"—Admiral Smyth's observations on S. Scorpii, *Speculum Hartwellianum*. This branch of observational astronomy is now engrossing so much attention, that an Association has been recently organized for the more diligent and systematic observation of the variable stars, some members of which have already distinguished themselves by important discoveries in this department.

γ 23.—2h. 55m. 1s., N. $52^{\circ} 58' 29''$. a 4, flushed white; b 14, clear blue; dist. $55''$. A wide double star, on the left shoulder of Perseus, on the line from α to η , and about $\frac{2}{3}$ the distance, forms a nearly equilateral triangle with α and θ .

δ 39.—3h. 33m. 19s., N. $47^{\circ} 21' 14''$. a $3\frac{1}{2}$, flake white; b 11, pale blue; dist. $140''$. On the left hip of Perseus, 4° s. f. a , pointed at by γ and α , at rather more than half the distance.

ϵ 45.—3h. 48m. 48s., N. $39^{\circ} 56' 58''$. a $3\frac{1}{2}$, pale white; b 9, lilac; dist. $8''\cdot4$. A fine and delicate double star, under the right knee, forms an equilateral with β and δ .

ζ 44.—3h. 45m. 38s., N. $31^{\circ} 28' 52''$. a $3\frac{1}{2}$, flushed white; b 10, smalt-blue; c 12, ash-coloured; d 11, blue; dist. $a-b$, $13''\cdot2$; $a-c$, $82''\cdot9$; $a-d$, $121''$. A fine quadruple group in the right foot of Perseus, more than midway from ϵ to the Pleiades.

η 15.—2h. 40m. 51s., N. $55^{\circ} 19' 55''$. a 5, orange; b $8\frac{1}{2}$, smalt-blue; dist. $28''\cdot 4$. A fine double star on the head of Perseus. Professor Barlow has observed that there are three small stars nearly on the line of the principal star on one side, and one star on the other, forming a miniature of Jupiter and his satellites. A line from a over γ , and half the distance beyond, will touch it.

θ 13.—2h. 34m. 48s., N. $48^{\circ} 39' 27''$. a 4, yellow; b 13, violet; c 11, green; dist. $a-b$ 15, $a-c$ $27''$. A fine triple star, on the right shoulder; forms the p . angle of a nearly equilateral triangle with a and γ .

μ 51.—4h. 4m. 59s., N. $48^{\circ} 3' 46''$. a $4\frac{1}{2}$, greenish-yellow; b 10, pale blue; dist. $92''\cdot 7$. On the left knee of Perseus, less than half the distance from Marfak to Capella. μ and ν Persei are both numbered 51 by Malby's *Globe* Atlas, but ν Persei is 51 Andromedæ.

χ 7.—2h. 8m. 35s., N. $56^{\circ} 53' 26''$. a $6\frac{1}{2}$, yellow; b 12, bluish; c 9, greenish; dist. $a-b$ $65''$, $a-c$ $12''\cdot 2$. A multiple star, in rich fields, just of the great cluster 33 H. VI.

12.—2h. 33m. 45s., N. $39^{\circ} 37' 23''$. a 6, yellow; b $7\frac{1}{2}$, pale blue; c 8, lilac; dist. $22''\cdot 9$. A pointer to a double star, in the n . f . quadrant; diff. in R. A. 10s. p . the group in the head of Medusa. A line from ϵ carried a little s . β , and half the distance beyond, will find it.

20.—2h. 45m. 10s., N. $37^{\circ} 47' 13''$. a $6\frac{1}{2}$, pale white; b 10, sky-blue; dist. $13''\cdot 9$. A beautiful object, and a fair test for a moderate telescope. A line from β carried a little f . π , and as far again, will show it, $\frac{1}{2}^{\circ}$ f . the star 16 5th magnitude.

33 H. VI.—2h. 9m. 41s., N. $56^{\circ} 31' 29''$. a 8, white; b 10, pale grey; dist. $9''\cdot 5$. A delicate double star, in the gorgeous cluster in the sword-hand of Perseus (see above).

34 M.—2h. 33m. 21s., N. $42^{\circ} 9' 17''$. a and b both 8, and both white; dist. $14''$. A double star, in a fine cluster. A splendid field (see above).

“37 P. III.—3h. 13m. 40s., N. $48^{\circ} 43' 38''$. 6th mag., orange; near a , s . a little p . Has a fine blue companion, in a beautiful field.”—Webb.

40.—3h. 33m. 48s., N. $33^{\circ} 30' 59''$. a 6, pale white; b 10, ash-coloured; dist. $20''\cdot 6$. A delicate object, on the p . wing of the ankle of Perseus. Forms the p . angle of a nearly equilateral triangle with ζ and ξ . 40 is α^2 Persei.

43.—3h. 46m. 34s., N. $50^{\circ} 18' 3''$. a $6\frac{1}{2}$, white; b 10, red; dist. $75''$. A wide and delicate object. a is said to be variable. 1° p . λ .

57.—4h. 23m. 55s., N. $42^{\circ} 46' 21''$. a 8 and b $8\frac{1}{2}$, both white; dist. $110''\cdot 3$. On the left ankle of Perseus, midway between ϵ and Capella.

58.—4h. 27m. 20s., N. $40^{\circ} 59' 8''$. a $5\frac{1}{2}$, orange-tint; b $7\frac{1}{2}$, greenish; c 9, lilac; dist. $11''\cdot 6$. On the left heel of Perseus. a is a pointer to a distant pair s . f .; diff. in R. A. 4s. 2° s . of 57, a little f .

80 H. VIII.—3h. 39m. 11s., N. $52^{\circ} 14' 45''$. a 8, light yellow; b 11, pale violet; dist. $9''\cdot 5$. A delicate double star, in a cluster, at the f . angle of a triangle with two equal sides, γ to a , a to 80 H. VIII. On the line and midway from λ Per. to the star 4 Draconis.

220 P. II.—2h. 51m. 15s., N. $51^{\circ} 48' 46''$. a 6, silvery white; b 8 sapphire-blue; dist. $12''\cdot 5$. On the nape of the neck of Perseus, about midway between η and ι 18 of *Hevelius's Catalogue*.

PISCES.

One of the Zodiacal constellations, the equinoctial colure now passes through it. The symbol consists of two Fishes linked together by a ribbon, a source of great confusion to observers, occupying a large space unmarked by any very bright stars. The great square or rectangular figure in Pegasus forms a guide to the position of the Fishes, the line of Alpherat and Algenib being parallel to and 12° *p.* the body of the northern Fish, which follows the right arm of Andromeda, and the line of Algenib and Markab intersects the head of the southern Fish as it lies on the parallel of R. A., over the equator and under the wing of Pegasus. Pisces consists of 113 stars, and may be observed at the same time with Andromeda and Pegasus.

Double Stars.

α 113 Okda.—1h. 55m. 3s., N. $2^\circ 6' 39''$. *a* 5, pale green; *b* 6, blue; dist. $3''\cdot 8$. A close and very fine object, suspected binary; near the neck of the Whale, in the *s. f.* coil of the ribbon which joins the Fishes. A perpendicular line of 6° erected at α (Mira) on the line of the three bright stars γ , α , ζ Ceti, will touch it.

ζ 86.—1h. 6m. 48s., N. $6^\circ 51' 43''$. *a* 6, silvery white; *b* 8, pale grey; dist. $12''$. A fine and easy object, pointed to by δ and ϵ at the same distance beyond. 3° *f.* ϵ , a little *s.* of the parallel of R. A. Suspected of variability.

ι 17.—23h. 32m. 59s., N. $4^\circ 53' 53''$. *a* $4\frac{1}{2}$, light yellow; *b* 12, pale blue; dist. $199''$. A fine star, with a distant companion, on the body of the preceding Fish. It hangs midway between Markab and Algenib, but 9° *s.* of the line. $\frac{1}{2}$ the distance from Markab to β Ceti.

σ^2 76.—0h. 58m. 46s., N. $31^\circ 27' 35''$. *a* 6, deep yellow; *b* $10\frac{1}{2}$, blue; *c* 11, ruddy; dist. *a—b* $56''$, *a—c* $140''$. A coarse triple star, just over the snout of the northern Fish, $3\frac{1}{2}^\circ$ *s.* of β Androm., 1° *p.* A line from Alpherat over δ Androm., and carried as far again, will find it.

ϕ 85.—1h. 6m. 25s., N. $23^\circ 52' 7''$. *a* 6, orange; *b* 13, flushed; dist. $9''$. A beautiful object, on the ventral fin of the northern Fish; rather less than midway between δ Androm. and Mesarthim, 1° *s.* of the line of direction. Forms the *s.* and *f.* angle of a nearly equilateral triangle with α Androm. and β .

ψ^1 74.—0h. 58m. 27s., N. $20^\circ 45' 0''$. *a* $5\frac{1}{2}$ and *b* $5\frac{1}{2}$, both silvery white; dist. $30''\cdot 2$. A fine wide double star, one of a group, near the dorsal fin of the northern Fish. 2° *s. f.* η Androm., which is on the lady's right elbow, in a group 15° due *s.* of β Andromedæ.

4 P. I.—1h. 3m. 49s., N. $8^\circ 50' 2''$. *a* 8, white; *b* 14, pale blue; dist. $35''$. A very delicate object, midway between Okda and Algenib. The line of three stars δ , ϵ , and ζ , will show it at 2° *n.* and 1° *p.* ζ .

34.—0h. 3m. 10s., N. $10^\circ 22' 57''$. *a* 6, silvery white; *b* $13\frac{1}{2}$, pale blue; dist. $7''$. A very fine and difficult double star, 4° *s.* and 1° *p.* γ Pegasi.

35.—0h. 8m. 1s., N. $8^\circ 4' 15''$. *a* 6, pale white; *b* 8, violet tint; dist. $12''$. A fine object. A line from Alpherat over Algenib, and carried 6° to the *s.*, will find it. One of a group.

38.—0h. 10m. 26s., N. $8^\circ 7' 33''$. *a* $7\frac{1}{2}$, light yellow; *b* 8, flushed white; dist. $4''\cdot 8$. An elegant pair, closely *f.* 35, the last object. One of a group, 6° *s.* and 1° *f.* Algenib.

42.—0h. 15m. 26s., N. $12^{\circ} 43' 56''$. *a* 7, topaz-yellow; *b* 13, emerald-green; dist. $35''$. The colours in fine contrast; in a blank field, $1\frac{1}{2}^{\circ}$ *s.* and $2\frac{1}{2}^{\circ}$ *f.* Algenib.

49.—0h. 23m. 46s., N. $15^{\circ} 17' 31''$. *a* 7, silvery white; *b* 13, cerulean-blue; dist. $15''$. Between the tip of the wing of Pegasus and the right hand of Andromeda, $4\frac{1}{2}^{\circ}$ *f.* and 1° *n.* of Algenib.

51.—0h. 25m. 26s., N. $6^{\circ} 12' 37''$. *a* $6\frac{1}{2}$, pearl white; *b* 9, lilac; dist. $28''$. A fine double star. A line from Algenib to η Ceti passes over it at $\frac{1}{3}$ the distance, or a line from ϵ Piscium carried just *s.* of δ , and as far again, will find it.

52.—0h. 25m. 31s., N. $19^{\circ} 33' 7''$. *a* 6, fine yellow; *b* 14, deep blue; dist. $25''$. A 'neat and most delicate double star, 1° less than half-way from ζ Andromedæ to Algenib.

55.—0h. 32m. 49s., N. $20^{\circ} 41' 52''$. *a* 6, orange; *b* 9, deep blue; dist. $5''\cdot9$. A very beautiful object, colours in fine contrast. "The larger star is yellow, the smaller purple or lilac."—Bishop. $9\frac{1}{2}^{\circ}$ due *s.* from δ Androm. on the same parallel of Declination.

65.—0h. 42m. 38s., N. $26^{\circ} 58' 31''$. *a* 6 and *b* 7, both pale yellow; dist. $4''\cdot5$. A fine double star. "The components of very nearly equal magnitude."—Bishop. On the right arm of Andromeda, $\frac{1}{3}$ the distance from Alpherat to Hamel (*a* Arietis).

77.—0h. 58m. 49s., N. $4^{\circ} 11' 3''$. *a* $7\frac{1}{2}$, white; *b* 8, pale lilac; dist. $32''$. A wide double star, 3° *s.* and 1° *f.* ϵ .

85 P. I.—1h. 21m. 18s., N. $7^{\circ} 15' 39''$. *a* 7, yellow; *b* $8\frac{1}{2}$, pale blue; dist. $68''\cdot3$. $6\frac{1}{2}^{\circ}$ *f.* ϵ , on the parallel of R. A.

100.—1h. 27m. 41s., N. $11^{\circ} 52' 4''$. *a* 7, white; *b* 8, pale grey; dist. $16''$. A fine object, suspected binary, closely *p.* π , a little *n.* A line from Hamel carried just *s.* of Mesarthim, and 2° more than as far again, will find it.

107.—1h. 35m. 11s., N. $19^{\circ} 37' 4''$. *a* $5\frac{1}{2}$, pale yellow; *b* 14, dusky; dist. $55''$. A very delicate but wide object. "The *comes* is so minute that light is inadmissible."—Smyth. It just precedes the Ram's horn, and forms the apex of a right-angled triangle, having a line from Sheratan to Mesarthim for its base, the right angle at the latter star.

123 P. I.—1h. 28m. 59s., N. $6^{\circ} 57' 15''$. *a* $6\frac{1}{2}$, yellowish; *b* 8, pale white; dist. $1''\cdot4$. A very close and beautiful double star, binary, period not ascertained, 9° *f.* ϵ , on the parallel of R. A. A line from β Arietis to η Ceti will just precede it, at 3° less than half-way.

"155 Σ .—1h. 35m. N. $8^{\circ} 34''$. *a* $7\frac{1}{2}$, *b* 7·9, both white; dist. $4''\cdot6$. Beautiful field, a little *n.* *p.* *o.*"—Webb. *o* is Flamsteed's 110, and is more than midway between *a* and η .

179 P. XXIII.—23h. 39m. 6s., S. $0^{\circ} 29' 5''$. *a* $8\frac{1}{2}$, pale white; *b* 15, blue; dist. $3''$. A most delicate double star, a difficult test-object, $1\frac{1}{2}^{\circ}$ *s.* *f.* λ . The object is found at the southern vertex of an equilateral triangle with its base line from ω 28 to θ 10, under the ventral fin of the preceding Fish.

209 P. I.—1h. 48m. 55s., N. $1^{\circ} 10' 39''$. *a* 7, silvery white; *b* $7\frac{1}{2}$, white; dist. $1''\cdot5$. A very close and fine object, nearly 2° *p.* *a*, and 1° *s.* 1° *f.* the line from β Arietis to ζ Ceti.

251 P. O.—0h. 52m. 29s., N. $0^{\circ} 3' 15''$. *a* 8, pale orange; *b* 9, clear blue; dist. $18''\cdot5$. A fine though wide double star, nearly on the equator. 1° *p.* the star 26, a little *s.* of the parallel of R. A. 26 is less than $\frac{1}{3}$ the distance from ϵ to η Ceti.

PISCIS AUSTRALIS.

A small asterism (the Southern Fish), in the southern hemisphere. Under the legs of Aquarius; lying on the parallel of R. A. with its head towards the east and its tail to the west. Introduced for the sake of the following object.

Double Star.

α Fomalhaut.—R. A. 22h. 50m. 11s., S. D. $30^{\circ} 20' 21''$. a 1, reddish; b $9\frac{1}{2}$, dusky-blue; diff. in R. A. 4s.8. A splendid star, with a distant companion, a well-known nautical star, of great interest to navigators. Its lunar distances are computed and given in the *Nautical Almanac*. Fomalhaut is about 8° above the horizon in the latitude of London (15th September, 10 p. m., S. E.) pointed at by Scheat and Markab, at more than three times the same distance. Fomalhaut is generally supposed to reign in solitary grandeur, but there are two faint stars in the field, and it is not improbable that a close companion may yet be discovered, as in the cases of Sirius and Antares.

PLEIADES.

This well-known group is properly in the constellation of Taurus, on the shoulder of the Bull, but it is so distinct and isolated, and of so much interest to the observer as to constitute a miniature constellation. Its interest has been much heightened by the recent discovery of a nebula in the group, by Temple, at Venice (19th October, 1859); also observed by Scmidth, at Athens (5th February, 1861). Scmidth describes it as "very large, very pale, and of no definite form." Supposed to be variable, like the variable nebula discovered by Hind, in 1852, in Taurus, only 4° distant. The names of the seven Pleiades are, Merope, Alcyone, Celeno, Electra, Taygeta, Asterope, and Maia. Merope is said to be "the lost Pleiad," but can easily be recognized by a good eye. The *Astronomical Register* for June, 1863, contains a map of the Pleiades, as seen by the unassisted eye, by a member of the family of Professor Airy, the Astronomer Royal, showing no less than 12 stars in the group. In the age of the patriarch Job, the Pleiades seem to have been well known. "Canst thou bind the sweet influences of the Pleiades?"—Job xxxviii. 31.

Double Stars.

η 25 Tauri Alcyone.—R. A. 3h. 39m. 28s., N. D. $23^{\circ} 41' 9''$. a 3, greenish-yellow; b 7, pale white; dist. 115". A fine star, the lucida of the Pleiades, with three distant companions, which form a triangle. With three very faint and minute stars about the same distance in the *s. f.* quadrant. There is a nearly vertical chain of small stars leading to η . Alcyone was at one time thought to be the central sun of our solar system, but the opinion has not obtained amongst recent astronomers.

15.—3h. 37m. 51s., N. $22^{\circ} 43' 30''$. *a* 8, bright white; *b* 14, fine blue; dist. $5''\cdot 0$. A most delicate double star, in the *n. p.* part of the group, discovered by Struve.

19 Taygeta.—3h. 37m. 10s., N. $24^{\circ} 2' 37''$. *a* 5, lucid white; *b* 10, violet-tint; dist. $45''$. A wide object, near 15, in the northern portion of the cluster.

23 Merope.—3h. 38m. 19s., N. $23^{\circ} 31' 41''$. *a* 5, silvery white; *b* 8, purple; *c* 9, pale blue; dist. $32''\cdot 5$. A bright star, pointing to a small pair in the south of the field; near Alcyone, *n. p.*

27 Atlas.—3h. 41m. 8s., N. $23^{\circ} 38' 24''$. *a* 5, intense white; *b* 9, pale blue; diff. in R. A. 11s.5. A bright star with a distant companion, bringing up the rear of the Pleiades.

PYXIS NAUTICA.

The Mariner's Compass is a small asterism formed by Lacaille. It is placed on the poop of Argo on the Maps S. D. U. K., but on the mast on Malby's Globe (1858).

Cluster.

63 H. VII.—R. A. 8h. 31m. 33s., S. D. $29^{\circ} 28' 30''$. "A compressed cluster, on Argo's compass card, 10th to 15th magnitudes, with a glow of star-dust. This object lying in a region devoid of large stars, is only to be fished up by running a line from the cluster in Orion's sword over Sirius, and extending it twice as far again into the south-east region."—Smyth. A line from Sirius over ξ 7 Argûs (which precedes Tureis by $4\frac{1}{2}^{\circ}$), and produced as far again, will find it.

SAGITTA.

The small asterism of the Arrow is visible to the naked eye as an arrow-shaped line of stars. The three stars Albireo in Cygnus, Svalocin in the Dolphin, and Altair in Aquila, form an isoceles-triangle, and the Arrow crosses its centre as the cross line of the letter A, parallel to its base, with its point towards the east. Rises in April and sets in November. N. Vulpecula; E. Delphinus; S. Aquila; W. Anser and part of Hercules.

Cluster.

71 M.—R. A. 19h. 47m. 43s., N. D. $18^{\circ} 25' 51''$. A large condensed cluster, in the Milky Way, showing symptoms of resolvability in a 4-inch aperture telescope. On the shaft of the Arrow, 1° *p.* and 1° *s.* of γ . There is a very splendid field 1° *s. p.*

Double Stars.

ϵ 4.—19h. 31m. 11s., N. $16^{\circ} 9' 42''$. *a* 6, pale white; *b* 8, light blue; dist. $92''\cdot 2$. On the upper wing of the Eagle. $1\frac{1}{2}^{\circ}$ *s. p.* β Sagittæ, pointed at by β Aquil. and α Aquilæ, at three times the distance.

ζ 8.—19h. 42m. 59s., N. 18° 28' 23". *a* 5, silvery white; *b* 9, blue; dist. 8".6. A neat double star, over the reed of the Arrow, closely *n. f.* δ.

θ 17.—20h. 3m. 59s., N. 20° 30' 52". *a* 7, pale topaz; *b* 9, grey; *c* 8, pearly yellow; dist. *a—b* 11".4, *a—c* 70".1. Followed on the parallel of R. A. by a fine double star. θ is near the head of the Arrow, more than midway between β Cygni and α Delphini, a little *p.* the line of direction.

SAGITTARIUS.

An extensive constellation, one of the southern zodiacal signs. The northern part very well marked to the naked eye. Consists of 69 stars: one of the 2nd magnitude (σ Al Sadira), seven of the 3rd (α Ruchbah, β Urkab, δ, ε, ζ, π), the rest lower. Its low position renders it difficult of observation in the latitude of Great Britain. The eye is struck by five bright stars, μ, σ, ε, ζ, and δ, which (excepting μ), form the figure of a Rhomboid, or an oblique parallelogram, 9° due north of the preceding side is the bright star μ¹, which marks the upper point of the Archer's Bow. Rises in June and sets in September. N. Antinous and the Shield of Sobieski; E. Capricorn; S. Corona Australis; W. Ophiuchus and Scorpio.

Nebula.

51 H. V.—R. A. 19h. 36m. 11s., S. D. 14° 28' 15". A planet-like nebula, of a pale blue colour. "This fine object is accompanied by several stars, four of which form a square about it."—Smyth. 9° *p.* a point midway between the two bright stars in the Goat's horn, on the parallel of R. A., and on the line to the Shield of Sobieski. About mid-distance between λ Antinoi and σ Capricorni, which is on the Goat's forehead. Marked 51 IV. on the Globe Atlas and Maps.

Clusters.

"8 M.—17h. 53m., S. 24° 50". A splendid galaxy-object, visible to the naked eye. In a large field, we find a bright coarse triple star, followed by a resolvable luminous mass, including two stars or starry centres, and then by a loose bright cluster, enclosed by several stars, a very fine combination."—Webb. 8 M. is 15° due *s.* of τ and ν Ophiuchi, and 10° *f.* θ Ophiuchi. "17h. 57m., S. 18° 50', is a spot referred to by Secchi, as exemplifying in a high degree the marvellous structure which he has observed in the galaxy with the great Achromatic at Rome. First, he finds large stars and lucid clusters; then a layer of smaller stars, certainly below the 12th mag.; then a nebulous stratum with occasional openings. But what startled him, was the regular disposition of the larger stars to form spiral curves."—Webb. Secchi's observations were anticipated many years before by Lord Rosse's discovery of spirals in the formation of clusters as well as of nebula. See under 5 Libræ. Secchi's spiral cluster is "a little *n. p.* μ, 17h. 57m., S. 18° 50'." 8 M. is not indicated on the Globe Atlas.

21 M.—17h. 56m. 31s., N. 22° 30' 47". A loose cluster, in a rich part of the Milky Way, including a fine double star (see below). μ is the bright star in the upper part of the bow of the Archer. 21 M. is the most northerly of a

crowd of nebulae, embracing 21 M., 20 M., 8 M., &c. within a circle of 4° diam., just without the vertical base-line of a nearly equilateral triangle formed by σ , μ , and δ . There is another group within the triangle on the same parallel of R. A., which includes 22 M. and 28 M. 21 M. is $\frac{1}{2}^\circ$ s. of the line of direction from μ Sagittarii to θ Ophiuchi, and rather less than $\frac{1}{4}$ the distance.

22 M.—18h. 27m. 56s., S. 24° 0' 27". "A magnificent globular cluster, gradually brightening to the middle, but not to a nucleus—stars 12th to 20th mag. Those of the 12th seem equally scattered over it, those of the 20th seem to form the central mass."—H. "It consists of very minute and thickly condensed particles of light, with a group of small stars preceding by 3m., somewhat in a crucial form."—Smyth. 1° less than midway in a line from σ to μ .

25 M.—18h. 23m. 42s., S. 19° 9' 35". A scattered cluster of large and small stars just s. of the Shield of Sobieski, 4° f. and 2° n. of μ Sagittarii, or a line from μ Aquilæ carried just s. λ Antinoi, and rather more than as far again, will touch the group which embraces 25 M.

28 M.—18h. 16m. 13s., S. 24° 56' 22". "A compact cluster of very minute stars, between the Archer's head and his bow. It lies nearly midway between β Ophiuchi and β Lyræ, and about $\frac{1}{2}^\circ$ to the north-east of 105 Hercules."—Smyth. There is a very strange mistake here, the first pointer "between the Archer's head and his bow," is correct, but the second referring to a star in Hercules, distant 50° in N. Declination is certainly an error. The solution is probably to be found in the fact, that the latter pointer was supplied by another hand, misled by the blunder of the Globe Atlas, and also of the large Maps of the S. D. U. K., in registering 28 Messier twice, one in Sagittarius and a second near the star 105 in Hercules. 28 M. lies 1° n. p. λ Sagittarii.

30 H. VII.—18h. 4m. 38s., S. 21° 35' 59". A large coarse cluster of minute stars 10th to 13th magnitude, in a rich field in the galaxy. A little s. p. μ , on the northern tip of the Archer's bow. Marked 30 II. on the Globe Atlas, and on the Maps S. D. U. K. 31 H. VII. lies 1° s. f. μ .

75 M.—19h. 58m. 6s., S. 22° 17' 56". A fine globular cluster, very faint, a miniature of 3 M. Difficult to find, 21° s. of θ Antinoi, and 2° p. the parallel of Declination. A line from α Ophiuchi to a point 1° p. λ Antinoi, and produced as far again, will show 75 M. It lies between the croup of Sagittarius and the Sea Goat's horn.

Double Stars.

μ^1 13.—18h. 5m. 38s., S. 21° 5' 34". a 3½, pale yellow; b 16, blue; c 9½ and d 10, both reddish; dist. a — b 10", a — c 40", a — d 45". A fine quadruple star. c and d point to a coarse double star n. p., on the north tip of the Archer's bow. A line from γ Aquilæ carried over λ Antinoi, and rather more than as far again, will show it. μ is a good pointer to several fine objects.

σ 34.—18h. 46m. 52s., S. 26° 27' 40". a 3, ruddy; b 9½, ash-coloured; dist. 309". Suspected variable, 2nd to 4th magnitude; on the right shoulder of Sagittarius, a little s. of the same parallel of R. A. with Antares. Forms a fine triangle with μ and δ .

21 M.—7h. 56m. 31s., S. 22° 30' 47". a 9, yellowish; b 10, ash-coloured; diff. in R. A. 0s.8. A close pair, in a fine cluster (see above).

43 P. XIX.—19h. 10m. 38s., S. 18° 56' 19". a 8, white; b 11½, pale grey; dist. 38".6. A wide object, in the group f. the Archer's head, a little n., close to Flamsteed's 43. A line from ϵ over σ , and 1½° less than the same distance beyond, will find it.

54.—19h. 32m. 59s., S. $16^{\circ} 35' 57''$. a $5\frac{1}{2}$, yellow; b 8, violet; c 16, blue; dist. $a-b$ $28''\cdot 5$, $a-c$ $20''$. A delicate triple star. 54 and 55 form a wide double star to the naked eye, midway between the head of Sagittarius and the tip of the Goat's horn.

SCORPIO.

One of the zodiacal signs, "the accursed constellation" of the astrologers, the torment and yet the delight of astronomical observers, from its low position, brief period above the horizon, and fine telescopic objects. Consists of 44 stars: α (Antares) of the 1st mag.; β of the 2nd; δ , ϵ , ι , κ , λ (Lesath), μ , π , τ , of the 3rd; the rest lower. Rises in the S. E. in May, culminates in July, and sets in August. N. Ophiuchus and Serpens; E. Sagittarius; S. Lupus; W. Libra.

Nebulæ.

4 M.—R. A. 16h. 15m. 22s., S. D. $26^{\circ} 11' 14''$. A large, pale and granulated nebula, running up to a central blaze, elongated vertically. $1\frac{1}{2}^{\circ}$ p . Antares, on the same parallel of R. A.

62 M.—16h. 52m. 39s., S. $29^{\circ} 53' 4''$. A large resolvable nebula, with a blazing centre. Admiral Smyth remarks, "To my annoyance, this nebula was started as a comet some years ago, by a gentleman who ought to have known better." A line from δ over Antares, and as far again beyond, will place it in the field.

Cluster.

80 M.—16h. 8m. 57s., S. $22^{\circ} 39' 20''$. A fine bright globular cluster, resembling the nucleus of a comet, midway between α and β . Erroneously placed in Ophiuchus by the Maps S. D. U. K.

Double Stars.

α 21 Antares, Cor Scorpionis.—16h. 21m. 7s., S. $26^{\circ} 7' 50''$. a 1, fiery red; b 8, pale; diff. in R. A. 33s.1. The interest of this splendid star has become very intense since the discovery in 1846, attributed to the late Professor O. M. Mitchel, U. S., of a bluish-green companion star. It has been recently stated, that this discovery belongs properly to J. W. Grant, Esq., of Elchies, Morayshire, who first saw the green companion to Antares, in India, in 1844, two years before the discovery by the Cincinnati refractor, by Mitchel. The companion is 7th or 8th magnitude, and about $3''$ dist. Secchi, of Rome, thinks it may be variable. "Mr. Dawes noticed a curious proof of its independent—not contrasted light—when it emerged in 1856 from behind the dark limb of the Moon, before its overpowering neighbour."—Webb. Secchi has seen this close companion with an aperture of $2\frac{1}{2}$ of the great refractor. C. P. Smyth, Esq., in the report of his Astronomical experiment, in 1856, dwells on the astonishing visibility of the companion to Antares, from the Peak of Teneriffe.—*Phil. Trans.* 1858, p. 483. Admiral Smyth suspects the comes of variability. Antares makes a fine right-angled triangle with Spica and Arcturus, the right-angle at Spica.

β 9 Iklil.—15h. 57m. 35s., S. $19^{\circ} 25' 59''$. a 2, pale white; b $5\frac{1}{2}$, lilac; dist. $13''\cdot 1$. A fine star, with a distant companion; on the Scorpion's head, makes an equilateral triangle with a and π . β is at the northern vertex.

ν 14.—16h. 4m. 9s., S. $19^{\circ} 6' 23''$. a 4, bright white; b 7, pale lilac; dist. $40''$. A neat double star. "Jacob subdivides 7 into 7·8, dist. $1''\cdot 75$, and so I see it with my present very fine $5\frac{1}{4}$ -inch object glass, by Alvan Clark."—Webb. "This neat object was discovered to be triple by Captain Jacob, at Poonah, in 1847, who saw that b had a companion of the 8th mag., his instrument being a 5-foot telescope, with a power of 152; as Sir John Herschel had not seen it with his 20-foot reflector at Feldhausen, where it was in his sweep 722, Captain Jacob observes, 'probably c has recently emerged.' My impression of the colours in 1851 was, a yellowish-white, b pale lilac, while Lord Wrottesley's notation for 1857 was, a yellow and b bluish, c is of the nondescript tint called dusky."—Smyth, *Speculum Hartwellianum*. $2^{\circ} f.$ β , a little $n.$ of the parallel.

" ρ 5.—16h. 16m., S. $23^{\circ} 0'$. a 6, b 7. A beautiful close pair, two other 7th mag. stars in the field, 68 and 72 P. XVI."—Webb. $3^{\circ} n.$ of Antares, a little $p.$, under the right foot of Ophiuchus.

σ 20.—16h. 12m. 59s., S. $25^{\circ} 16' 0''$. a 4, creamy-white; b $9\frac{1}{2}$, lilac-tint; dist. $20''$. A delicate double star, $2^{\circ} p.$ Antares, $1^{\circ} n.$ of the parallel of R. A.

31 .—17h. 9m. 16s., S. $26^{\circ} 28' 35''$. a $6\frac{1}{2}$, pale white; b 11, ash-coloured; dist. $6''\cdot 8$. A neat object, $2^{\circ} s.$ and $1^{\circ} p.$ θ , which is on the left foot of Ophiuchus.

48 and 49 P. XVI.—16h. 12m. 36s., S. $19^{\circ} 47' 19''$. a 8, dull white; b 9, flushed; dist. $13''\cdot 9$. A pretty double star, $4^{\circ} f.$ β , and $1^{\circ} p.$ ψ , Ophiuchi. Marked 43 on the Globe Atlas, and on the Maps S. D. U. K.

236 P. XVI.—16h. 49m. 7s., S. $19^{\circ} 19' 23''$. a $6\frac{1}{2}$, yellowish-white; b 10, pale green; dist. $5''\cdot 8$. A delicate double star, suspected binary. A line from Antares to η Ophiuchi, will touch it at $\frac{2}{3}$ the distance.

S E R P E N S .

A constellation excessively difficult to recognize, from its extreme length and complex sinuosities, winding through Ophiuchus, Aquila, Libra, and Hercules. The head, neck, and fore part seem the only portions very distinctly visible to the naked eye, and are particularly marked out by a wavy line of bright stars of the 2nd and 3rd magnitude, beginning at β Herculis (Kornefora), and continuing to Yed Prior and Yed Post. Consists of 64 stars. Rises and sets with Ophiuchus, and may be observed at the same time. N. Corona Borealis and Ophiuchus; E. Aquila and Clypeus Sobieski; S. Sagittarius and Scorpio; W. Libra and Bootes.

Cluster.

"72 H. VIII.—R. A. 18h. 20m., N. D. $6^{\circ} 30'$. A very fine cluster, with a 6th mag. star in the field, visible to the naked eye. Between it and θ , nearer the former, is a beautiful large cloud of stars, chiefly 8th and 9th mag., visible to the naked eye, requiring a large field."—Webb. $\frac{1}{2}$ the distance, a little $s.$ from θ (Alya 63) to a Ophiuchi.

Double Stars.

α 24 Unukalhay, Cor Serpentis.—15h. 37m. 36s., N. $6^{\circ} 51' 0''$. a $2\frac{1}{2}$, pale yellow; b 15, fine blue; dist. $50''$. The lucida of Serpens, an extremely delicate object. A line from ϵ Herculis over γ Herc., and 1° more than as far again, will find it.

β 28.—15h. 37m. 39s., N. $10^{\circ} 50' 53''$. a $3\frac{1}{2}$ and b 10, both of a pale blue tint; dist. $31''$. A delicate double star, at the hinge of the Serpent's under jaw, the p . star of a magnificent curve, formed by the stars ϵ , ζ , β , γ , κ Herculis, and γ and β Serpentis, 9° n . of a , a little f . the parallel of Declination.

δ 13.—15h. 28m. 21s., N. $10^{\circ} 59' 32''$. a 3, bright white; b 5, bluish white ("a and b blue."—Arago); dist. $2\cdot 8$. A remarkably fine and beautiful double star, discovered by H. 1782; binary, period not ascertained. Pointed to by ϵ and a , at twice the distance beyond. The nearest star of the curve of bright stars in the Serpent's neck to Arcturus.

η 58.—18h. 14m. 20s., S. $2^{\circ} 56' 28''$. a 4, golden-yellow; b 13, pale lilac; dist. $110''\cdot 9$. A most delicate and difficult object, in the Serpent's tail, over the Shield of Sobieski; midway between β Ophiuchi and λ Antinoi, but $2\frac{1}{2}^{\circ}$ $s. p.$ the line of direction. Pointed at by ν and τ Oph. at three times the distance beyond.

θ 63 Alya.—18h. 49m. 30s., N. $4^{\circ} 1' 33''$. a $4\frac{1}{2}$, pale yellow; b 5, golden-yellow; dist. $21''\cdot 6$. A fine double star, on the tip of the Serpent's tail; pointed at by α Aquil. and μ Aquilæ, at twice the distance beyond. θ Serpentis, with ζ Aquil. and μ Aquilæ, make an equilateral triangle, θ at the southern and preceding angle.

ν 53.—17h. 13m. 13s., S. $12^{\circ} 42' 26''$. a $4\frac{1}{2}$, pale sea-green; b 9, lilac; dist. $50''\cdot 8$. A wide double star, 3° $n. f.$ η 35, on the line from Antares over η . A line from σ Sagittarii over μ in the tip of the bow, and 3° more than as far again, will find it. One of the rare instances of the principal constituent of a double star being found of a green colour.

5.—15h. 12m. 24s., N. $2^{\circ} 16' 59''$. a $5\frac{1}{2}$, pale yellow; b $10\frac{1}{2}$, light grey; dist. $10''\cdot 3$. A very delicate double star, close to the beam of Libra. In the field with the great spiral cluster 5 Messier (see Libra). Pointed to by κ and δ Serpentis, at 1° more than the same distance beyond.

39.—15h. 46m. 55s., N. $13^{\circ} 37' 55''$. a $7\frac{1}{2}$, white; b 15, bluish; dist. $12''$. A most delicate double star, on the back of the Serpent's head. Forms a triangle with γ and β . On the line from γ to a , $\frac{1}{4}$ the distance.

49.—16h. 7m. 10s., N. $13^{\circ} 53' 37''$. a 7, pale white; b $7\frac{1}{2}$, yellowish (7 and 7·8 both yellowish; dist. $3''\cdot 3$. A close double star, "binary character very probable."—Bishop). "A period of 600 years is countenanced."—Smyth. On the guard of the left arm of Hercules, 5° $f.$ the last object. 1° less than half-way from β Herculis to ϵ Serpentis.

59.—18h. 20m. 17s., N. $0^{\circ} 5' 37''$. a $5\frac{1}{2}$, yellow; b 8, indigo-blue; dist. $3''\cdot 9$. A very neat double star, on the Serpent's tail, 3° $n.$ and $1\frac{1}{2}^{\circ}$ $f.$ η 58, nearly on the line from ν and τ Ophiuchi.

76 P. XV.—15h. 20m. 0s., N. $18^{\circ} 38' 48''$. a 8, b $9\frac{1}{2}$, both white; dist. $1''\cdot 7$. A very close and most difficult double star, $p.$ the head of the Serpent. A line from γ Herculis just to the $n.$ of κ Serpentis and within $1\frac{1}{2}^{\circ}$ of as far again, will find it. In the field with the nebula 874 H. II.

220 P. XV.—15h. 50m. 30s., N. $3^{\circ} 47' 53''$. a 8, white; b 9, grey; dist. $10''\cdot 5$. A neat double star, on the Serpent's back. A line from a carried a little $n.$ of ϵ , and $\frac{1}{2}^{\circ}$ less than as far again, will find it.

SEXTANS.

A small modern Asterism, to the south of Leo, originated by Hevelius, A. D. 1590, to commemorate the destruction by fire of his house, observatory, and astronomical instruments. Consists of 41 stars; may be observed the same time with Leo.

Nebulæ.

4 H. I. and 3 H. I.—R. A. 10h. 7m. 16s., N. D. $4^{\circ} 7' 46''$. “A bright-class round nebula, with another larger but more faint, at about 29s. on the following parallel.”—Smyth. As indicated on the Globe Atlas and Maps S. D. U. K. 3 H. I. immediately *precedes* 4 H. I., on the same parallel of R. A., under the chest of Leo. In a magnificent field, 9° s. of Regulus, and $1\frac{1}{2}^{\circ}$ f. the parallel of Declination, 685 H. A line from μ Leonis carried to a point $\frac{1}{2}^{\circ}$ p. Regulus, and half as far again, will find the objects. “This object (4 H. I.) is on or near the spot where the Capuchin De Rheita fancied he saw the napkin of S. Veronica, in 1643, with an improved telescope (binocular), which he had just constructed. In craving permission to doubt his assertion, Sir John Herschel’s words may be applied: ‘Many strange things were seen among the stars, before the use of powerful telescopes became common.’”—Smyth.

163 H. I.—9h. 58m. 31s., S. $7^{\circ} 4' 5''$. A bright elongated nebula, of a willow-leaf shape. Its major axis trends towards the vertical of the s. p. and n. f. quadrants, 668 H. Difficult to find, 20° due s. of Regulus, and 1° p. the parallel of Declination. A line from ζ Leonis carried to a point just 1° f. Regulus, and $1\frac{1}{2}$ times the same distance, will fall short of the object by 1° .

Double Stars.

9.—9h. 47m. 3s., N. $5^{\circ} 34' 51''$. a 7, flushed blue; b 9, pale blue; dist. $50''$. In the right fore-leg of Leo. A line from Regulus over π , and 1° less than as far again, will touch it.

35.—10h. 36m. 20s., N. $5^{\circ} 27' 27''$. a 7, topaz-yellow; b 8, smalt-blue (“blue or greenish.”—Bishop); dist. $6''\cdot 8$. A fine double star, in a rich field. A line from η Leonis carried a little p. ρ 47, Leonis, and half as far again, will reach it.

41.—10h. 43m. 32s., S. $8^{\circ} 10' 58''$. a 6, white; b 16, dusky; c 10, bluish; dist. a—b $20''$, a—c $290''$. A most delicate triple star. 7° due n. of ν Crateris, a star in a group with 39. A line from ζ Crateris carried just f. δ Crateris, and 1° more than the same distance, will find it; or, a line from θ Leonis over χ , and carried twice as far again.

161 P. IX.—6h. 36m. 27s., N. $3^{\circ} 14' 40''$. a 8, yellowish-white; b 13, blue; dist. $4''$. A delicate double star discovered by Struve, on the right paw of Leo; 20° due s. of ϵ Leonis. 1° less than half way from Regulus to Alphard, and 1° p. the line of direction.

T A U R U S .

Taurus ranks amongst the first-class constellations for the number and interest of its telescopic objects. It embraces the fine groups the Hyades and Pleiades, and a great number of double stars, but only a few nebular objects of particular interest; comprises 141 stars. Rises in August, culminates in December and sets in April. N. Perseus and Auriga; E. Gemini and Orion; S. Orion and Eridanus; W. Cetus and Aries.

Nebulæ.

1 M.—R. A. 5h. 26m. 21s., N. D. $21^{\circ} 55' 28''$. A large, pale, and remarkably fine nebula, caught up by Messier while searching for a comet. This accidental circumstance led him to the formation of his celebrated catalogue of 103 star clusters and nebulae, which constitutes such a mine of treasure to the amateur astronomer with a small telescope. 1 M. has an oval form with its major-axis trending *n. p.* and *s. f.*, the brightest portion towards the south. This is the extraordinary "Crab Nebula" of the Earl of Rosse, resolved into stars by the great 6-feet reflector. It bears less resemblance, however, to a crab, than to a vast pine-apple, its branches clustering with gems and gold. Easily found, the line which joins β and ζ on the tips of the Bull's horns, will pass within $\frac{1}{2}^{\circ}$ of it, at 1° *n.* of ζ , a little *p.*

69 H. IV.—4h. 0m. 39s., N. $30^{\circ} 24' 40''$. A nebulous star in a small telescope, looks like a star out of focus. "A most singular phenomenon, a star 8th mag. with a faint luminous atmosphere of a circular form, and 3' in diameter."—H. This object led Sir W. Herschel to adopt the nebular theory, viz., the production of stars by condensation from nebulous matter. This theory has been generally abandoned since the extraordinary nebular revelations of Lord Rosse. See "Nichol's System of the World," p. 97.

* * * —4h. 13m. 54s., N. $19^{\circ} 11' 37''$. A faint nebula, known as "Hind's variable nebula." The proximity of a star of the 10th magnitude serves to identify the position, closely *p. ε.* ϵ forms the northern vertex of an equilateral triangle with α and γ . The *variability* of many of the nebulae may be a consequence of their revolution like the binary stars. The *revolution* of certain of the bicentral or double nebulae was suspected by the two Herschels, but has been demonstrated by Lord Rosse (See 60 Messier, in Virgo). Mr. Baxendell has discovered a new variable star in the constellation of Taurus, distant only about 19 minutes of arc from the place of the variable nebula discovered by Mr. Hind, in 1852. Its approximate mean place for 1860.0 is R. A. 4h. 13m. 40s., N. D. $19^{\circ} 28' 9$.

Double Stars.

α 87 Aldebaran.—4h. 28m. 10s., N. $16^{\circ} 14' 12''$. *a* 1, pale rose-tint; *b* 12, sky-blue; dist. $107'' 9$. A splendid star, in the eye of the Bull, with a distant companion; *b* is a good test-object. Rev. W. R. Dawes saw it with $3\frac{1}{4}$ -foot telescope of $2\frac{3}{4}$ -inch aperture, and a negative eye-piece magnifying 200 times. Easily known by its fine red colour, and by its position. Midway between the Pleiades and Orion, close to the group of the Hyades.

β 112 Nath.—5h. 17m. 45s., N. $28^{\circ} 29' 35''$. a 2, brilliant white; b 10, pale grey; diff. in R. A. 14s.5. A fine star, with a distant companion. In the tip of the *northern* horn of Taurus, and in the left ankle of Auriga. ζ Tauri is a fine star on the tip of the *southern* horn of the Bull, and is a pointer to the Crab nebula 1 M. β and ζ point to Betelgeux (α Orionis), at $1\frac{1}{2}$ times the distance.

η 25 Alcyone.—3h. 39m. 28s., N. $28^{\circ} 41' 9''$. See the Pleiades.

γ 54.—4h. 12m. 6s., N. $15^{\circ} 17' 56''$. a $3\frac{1}{2}$, fine yellow; b 11, pale blue; diff. in R. A. 17s.8. A bright star with a distant companion. The leader of the Hyades, the remarkable group near a . 4° $p.$ a , a little s .

θ^1 77 and θ^2 78.—4h. 20m. 51s., N. $15^{\circ} 39' 33''$. a 5, pearly white; b $5\frac{1}{2}$, yellowish; dist. $337''$. A pair of stars visible to the naked eye. On the Bull's face, in the midst of the Hyades. A physical connection suspected.

σ^1 91 and σ^2 92.—4h. 31m. 26s., N. $15^{\circ} 31' 51''$. a 5 and b 5, both pure white. "Look like a connected system, so do κ^1 and κ^2 , placed by Struve 4h. 15m. 6s., N. $21^{\circ} 52'$. a 5 and b 6."—Webb. 1° $p.$ a . σ^1 and σ^2 are both rated $5\frac{1}{2}$ magnitudes by the B. A. C.

τ 94.—4h. 34m. 8s., N. $22^{\circ} 41' 49''$. a 5, bluish white; b 8, lilac; dist. $61''$.6. At the root of the Bull's left horn, 4° $f.$ the group in the left ear. $6\frac{1}{2}^{\circ}$ $n.$ and 1° $f.$ a , less than mid-distance between ζ and the Pleiades.

ϕ 52.—4h. 12m. 3s., N. $27^{\circ} 1' 38''$. a 6, light red; b $8\frac{1}{2}$, cerulean blue; dist. $56''$. A wide double star, on the upper part of the Bull's neck, at the following angle of an equilateral triangle with the Pleiades and ζ Persei.

χ 59.—4h. 14m. 22s., N. $25^{\circ} 18' 28''$. a 6, white; b 8, pale sky-blue; dist. $19''$.8. A neat double star, at the back of the Bull's ear. 2° $s.$ and 1° $f.$ ϕ , on the line to a .

γ 7.—3h. 26m. 26s., N. $24^{\circ} 0' 38''$. a 6, white; b $6\frac{1}{2}$, pale yellow; c 11, bluish; dist. $a-b$ $0''$.7, $b-c$ $21''$.8. $a-b$ $0''$.6.—Struve. H. registered γ as a double star, not perceiving c . Struve first detected its duplicity. A fine and very difficult object. "Both stars (a and b) are yellowish-white, and of nearly equal magnitude."—Bishop. 3° $p.$ the Pleiades.

20 P. V.—5h. 8m. 50s., N. $18^{\circ} 17' 12''$. a 8 and b $8\frac{1}{2}$, both bluish; dist. $2''$.1. A neat and very close double star, on the southern horn; rather more than $\frac{1}{3}$ from ζ to Aldebaran, a little $s.$ of the line of direction.

25 P. V.—5h. 9m. 31s., N. $19^{\circ} 59' 4''$. a 8, bright white; b 11, bluish; dist. $10''$. A neat double star, with several companions. On the southern horn, rather less than $\frac{1}{3}$ from ζ to Aldebaran, a little $n.$ of the line.

30 .—3h. 40m. 52s., N. $10^{\circ} 43' 36''$. a 6, pale emerald (a greenish and b lilac; dist. $8''$.6.—*Speculum Hartwellianum*); b 10, purple; dist. $9''$. An elegant but very difficult double star, on the left shoulder. A line from ζ over a , and as far again, will find it.

37 P. V.—5h. 11m. 16s., N. $19^{\circ} 59' 32''$. a 7, deep yellow; b 11, bluish; dist. $9''$. A very delicate double star, on the southern horn. "The $f.$ of a curious series of six stars, nearly in the same declination, the one immediately $p.$ being 25 P. V."—Smyth.

62 .—4h. 15m. 51s., N. $23^{\circ} 59' 7''$. a 7, silver white; b $8\frac{1}{2}$, purple; dist. $29''$. A neat double star, in a rich field; on the left ear, between the group of v^1 , v^2 , and χ . 9° $f.$ the Pleiades.

80 .—4h. 22m. 26s., N. $15^{\circ} 20' 30''$. a 6, yellow; b $8\frac{1}{2}$, dusky; dist. $1''$.8 (a 7, b 10; dist. $1''$.6.—Bishop). A close and very difficult double star, suspected binary. On the Bull's face, in the Hyades. 2° $p.$ a , a little s .

88.—4h. 28m. 15s., N. $9^{\circ} 52' 54''$. a 5, bluish white; b $8\frac{1}{2}$, cerulean-blue; dist. $68''\cdot 5$. On the right fore-leg, $6\frac{1}{2}^{\circ}$ due $s.$ of a .

111.—5h. 16m. 32s., N. $17^{\circ} 15' 25''$. a 6, white; b $8\frac{1}{2}$, lilac; dist. $63''$. Under the southern horn. In the group 1° more than midway from β to Bellatrix.

118.—5h. 20m. 57s., N. $25^{\circ} 2' 16''$. a 7, white; b $7\frac{1}{2}$, pale blue; dist. $5''$. A very elegant double star, between the tips of the horns, rather nearer to β , and a little $p.$ the line. "No change in 70 years."—Smyth.

124 (164 P. V.)—5h. 31m. 3s., N. $23^{\circ} 14' 36''$. a $8\frac{1}{2}$, garnet; b 8 and c 9, both pale white; dist. $a-b$ $98''$, $b-c$ $5''$, $c-d$ $82''$. A very delicate object, 2° $n.$ of ζ , which is on the tip of the southern horn. Marked 164 on the Maps S. D. U. K. This star is classed 164 Piazzi in the *British Association Catalogue*.

213 P. III.—3h. 52m. 54s., N. $22^{\circ} 49' 8'$. a $7\frac{1}{2}$, white; b 8, grey; c 12, blue; dist. $a-b$ $7''\cdot 2$, $b-c$ $60''$. A delicate triple star, c a most difficult object. On the Bull's neck, less than halfway from the Pleiades to the group κ and ν , which is 3° $n.$ of ϵ .

257 P. IV.—4h. 51m. 20s., N. $14^{\circ} 20' 7''$. a 7, white; b 8, cerulean-blue; c 10, purple; dist. $a-b$ $39''$, $a-c$ $70''$. A wide triple star. c has a minute star $f.$ — $s.$ of the Bull's right ear, midway between ϵ and the group in the head of Orion.

295 P. IV.—4h. 59m. 52s., N. $24^{\circ} 5' 7''$. a 6, pearly white; b 13, pale blue; dist. $28''$. A neat double star, between the Bull's horns. On the line from β to a , rather more than $\frac{1}{3}$ the distance. This star is marked as Flamsteed's 103 on the Globe Atlas, and Maps S. D. U. K.

TAURUS PONIATOWSKI.

A small Asterism formed in 1777 by the Abbé Poczobut, of Wilna, in honour of Stanislaus Poniatowski, king of Poland. It is situated between the shoulder of Ophiuchus and Aquila.

Nebula.

6 Σ N.—R. A. 18h. 5m. 33s., N. D. $6^{\circ} 49' 21''$. A small but very bright nebula, in a rich vicinity, on the shoulder of the Polish Bull. Discovered by Professor Struve who thought it one of the most curious objects in the heavens. "Something between a planetary nebula and a bright round nebula."—H. $7\frac{1}{2}^{\circ}$ $f.$ and 2° $n.$ of β Ophiuchi, in the direction of ζ Aquilæ, and $\frac{1}{3}$ the distance. A line from β Herculis carried 1° $n.$ of a Herc., and as far again, will show it.

Double Stars.

362 P. XVII.—17h. 59m. 26s., N. $11^{\circ} 59' 44''$. a 8, straw-yellow; b $8\frac{1}{2}$, sapphire-blue; dist. $6''\cdot 9$. A neat double star, just over the tip of the Eagle's left wing. $\frac{1}{3}$ the distance from a Ophiuchi to ζ Aquilæ, 1° $s.$ of the line of direction, where it forms a nearly equilateral triangle with a and β Ophiuchi, "About 17h. 55m., N. $7^{\circ} 45'$, is a wide pair, a 8 and b $8\frac{1}{2}$, $1\frac{1}{4}^{\circ}$ $s.$ $p.$ 71, 6th magnitude."—Webb.

TRIANGULUM.

One of the ancient Asterisms, supposed to symbolize the Egyptian delta (Δ), formerly represented as an equilateral, but now as a scalene triangle. Hevelius introduced a second triangle close to the original but smaller. The asterism consists of 16 stars, and contains some fine telescopic objects. Rises in June and sets in February. N. Andromeda; E. Musca and Perseus; S. Aries; W. Andromeda and Pisces.

Nebula.

33 M.—R. A. 1h. 26m. 15s., N. D. $29^{\circ} 59' 5''$. A large globular-shaped nebula, very faint, yet visible in moonlight, filling nearly the whole field in a small telescope, resembling a dull cloud with a condensed mass at its centre. There are three neat double stars in the field, close to the nebula. "Resolved into stars by H., the smallest points imaginable."—Smyth. "An enormously large nebula, the diffused nebulosity extending $15'$ and as much nearly to the north."—H. One of the most singular and wonderful of the great spirals of Lord Rosse, resembling in outline somewhat the foot and claws of an enormous bird. H. must have been mistaken in supposing its resolution into stars, for even in Lord Rosse's 6-foot reflector it remains unresolved. "Sep. 13, 1850, large spiral full of knots; Oct. 25, 1851, nebulosity extends for several minutes all around, perhaps for half a degree of radius; Dec. 7, 1855, the nebulosity reaches in length through at least a field and a half of the finder eye-piece; Nov. 15, 1857, there are three stars about the principal nucleus."—Lord Rosse, *Obs.*, *Phil. Trans.* 33 M. is easily found, on the same parallel of R. A. f by $14^{\circ} \delta$ Andromedæ. On the line from β Andromedæ to α Arietis, 1° less than halfway. The pointers to 31 Messier become also pointers—but in an opposite direction—to 33 M. A line from ν Androm. passing closely f β Androm. to the same distance beyond, will place it in the field. A low power will show it best. On moving the telescope rapidly over it, the globular mass at the centre becomes more apparent.

Double Stars.

α 2 Mothallath.—1h. 45m. 22s., N. $28^{\circ} 55' 18''$. a $3\frac{1}{2}$, yellow; b 11, lilac; dist. $110''$. A fine star, with a distant telescopic companion, at the *s. p.* apex of the triangle. Midway between the small triangle of the three stars in Musca and δ Andromedæ. Forms the apex of an obtuse-angled triangle with α and β Arietis.

ϵ 3.—1h. 55m. 5s., N. $32^{\circ} 37' 51''$. a $5\frac{1}{2}$, bright yellow; b 15, dusky; dist. $5''$. A most delicate double star, marked "*difficilis*" in the *Dorpat Catalogue*. $\frac{1}{2}^{\circ}$ n. of the line from α to β , and 1° more than half-way. 9° s. of Almach.

ι 6.—2h. 4m. 32s., N. $29^{\circ} 40' 10''$. a $5\frac{1}{2}$, topaz-yellow; b 7, green; dist. $3''\cdot 5$. A fine and close double star, "smaller, and not so bright as α Herculis."—H. "The orbital change suspected in this beautiful object, may now be held as destroyed."—Smyth in *Speculum Hart*. 1860. s . of the triangle,—a line from γ Androm. over β Triang., and continued s . 1° more than half the distance, will find it, 5° f . α , and 1° n. Not lettered on the Maps S. D. U. K.

38 and 39 P. II.—2h. 9m. 35s., N. $28^{\circ} 7' 17''$. a $8\frac{1}{2}$ and b 9, both silvery white; dist. $14''$. A fine double star, between the triangle and the back of Aries, closely *p.* the star 10, which forms very nearly an equilateral-triangle with α Trianguli and α Arietis. On a line from ϵ through ι , and half the same distance beyond. Nearly midway on a line from a to Musca.

93 P. II.—2h. 20m. 53s., N. $29^{\circ} 19' 21''$. a $6\frac{1}{2}$, yellow; b 10, grey; dist. $2''\cdot 3$ (a 8, yellow; b $9\frac{1}{2}$, pale blue; dist. $2''$.—Bishop). The larger star is 13 of *Flamsteed's Catalogue*, and 269 of Struve's. An exquisite and difficult object, discovered by H. 1781. In a group between the Fly and the Triangle, $9^{\circ} f.$ ϵ , a little *n.* of the parallel of R. A. A line from Mesarthim through Hamel, and carried twice the distance further, will place it in the field. Professor Struve discovered the neighbouring star double (89 P. II.), the components $7\frac{1}{2}$ and $8\frac{1}{2}$ magnitudes, $1\frac{1}{2}''$ apart.

160 P. II.—2h. 36m. 36s., N. $28^{\circ} 53' 25''$. a 8 and b $8\frac{1}{2}$, both creamy white; dist. $2''\cdot 9$. A close double star, $\frac{1}{2}^{\circ} p.$ the northern star (39) of the small Triangle called Musca Borealis. A line from ϵ Arietis carried just *p.* 41 Muscæ, and produced 2° beyond, will show it.

URSA MAJOR.

A splendid constellation, the rival of Orion in magnificence of appearance in the heavens. Superior in extent, and in the number and variety of its telescopic objects, but inferior in the magnitude of its leading stars, and attendant constellations. Admiral Smyth observes that there is little in southern celestial scenery to counterbalance either in beauty or utility the loss of Ursa Major from the heavens. The figure known as Charles' Wain, or the Bear, is composed of seven stars: four fine stars α Dubhe, β Merak, γ Megrez, δ Phegda, forming a great quadrilateral figure, on the body of the Bear; the other three stars ϵ Alioth, ζ Mizar, η Benetnasch or Alkaid, forming a curve, or the tail of the Bear. Dubhe and Merak are the pointers to the Pole star. Consists of 87 stars—never sets to Great Britain. The Bear's head culminates in November and his tail in April. N. the Camelopard and Draco; E. Canes Venatici; S. Leo Minor; W. the Lynx and the Camelopard.

Nebulæ.

43 H. V.—R. A. 12h. 12m. 19s., N. D. $48^{\circ} 2' 46''$. A large oval-shaped nebula, with a bright nucleus in its southern part. A line from α through γ , and as far again, less 1° , will find it.

45 H. V.—11h. 46m. 44s., N. $53^{\circ} 4' 58''$. A large faint nebula, "a fine object."—H. "A singular lenticular mottled spiral, situated between three stars, a bright streak running obliquely through the nucleus."—Obser. Lord Rosse. "It has a peculiar appearance in the field from there being a coarse small double star to the north of it, and from its being followed by a vertical line of five equi-distant telescopic stellar attendants."—Smyth. $1\frac{1}{2}^{\circ} s.$ of γ , on the same parallel of Declination.

46.—H. V.—11h. 3m. 31s., N. $56^{\circ} 23' 43''$. An elongated nebula, faint, but well-defined, with a star at its *s. p.* apex. $2^{\circ} s. f.$ β Merak, a little *s.* of the line from β to γ .

60 H. IV.—10h. 30m. 20s., N. $54^{\circ} 12' 42''$. A small planet-like nebula, with a round disk. H. observed symptoms of a feeble atmosphere surrounding it. Nearly midway between γ and θ . A line from λ Draconis carried to a point 1° *p.* Dubhe, and as far again, will fall 2° short of it.

62 H. IV.—11h. 48m. 22s., N. $55^{\circ} 52' 22''$. A small well-defined nebula, planet-like, in a barren field, with a lilac star on its *s.* vertical, $1\frac{1}{2}^{\circ}$ *n. f.* γ . Marked 62 I. on the Maps S. D. U. K.

78 H. I.—9h. 37m. 13s., N. $72^{\circ} 54' 28''$. A bright round nebula. "A vertical pair of stars *p.* the nebula, and it is closely *f.* by a minute pair."—Smyth. Above the Bear's ear, closely *f.* the star 27.

81 M. and 82 M.—9h. 44m. 18s., N. $69^{\circ} 44' 55''$. A double nebula, in the same field with a low power, $\frac{1}{2}^{\circ}$ apart. 81 is a fine bright oval object, with a well-defined disc, even in a $3\frac{1}{4}$ -inch aperture refractor (There is one of Struve's close double stars in the field. *a* 9, and *b* 9, dist. $2''$. A fine and very difficult object). 82 M. may be brought into the northern part of the same field, $\frac{1}{2}^{\circ}$ distant. It is a long spindle-shaped object, with a nucleus like a star, and has a very cometary aspect. A curve line from κ Draconis over λ and 35 Ursæ Maj., and as far again beyond 35 as 35 is from λ , on the same parallel of R. A. will find the nebulae.

94 H. I.—11h. 34m. 3s., N. $37^{\circ} 16' 37''$. A large elliptical faint nebula, in a blank region, behind the Bear's hind-leg. H. 945. A line from γ carried a little *f.* χ 63, and twice the distance beyond, will find it.

97 M.—11h. 6m. 52s., N. $55^{\circ} 44' 51''$. A large planet-like nebula, about the size of Jupiter, discovered by H. 1789, who describes it as a globular body of equable light whose profundity was beyond the guaging power of his 20-feet telescope. "A large uniform disc, quite round, diam. $19''$, very bright, not sharply defined but yet suddenly fading away into darkness; a most extraordinary object."—H. Familiarly known in the Parsonstown Observatory as "the owl nebula," from its resemblance to the face of an owl. The two eyes, or the nuclei of the nebula are resolved into stars, one a right-hand and the other a left-hand spiral. What renders this object the more wonderful is, that it belongs to the class of variable nebulae. The owl has been caught in the fact of gradually (from 1843 to 1862) closing up one eye, and opening wide the other. "March 11, 1848, Dr. Robinson observing two stars considerably apart in the central region; a dark penumbra around each spiral arrangement; stars as apparent centres of attraction; stars sparkling in it; resolvable."—Lord Rosse's *Obser. Phil. Trans.* 1862. Note by Mr. Rambent.—"March 5, 1848. Saw two dark and very large spots in the middle, Lord Rosse remarked that all round the edge the sky appeared darker than the average." 97 M. is 2° *s. f.* β (Merak), in the direction of χ 63— 5° *f.* the star 44, nearly on the parallel. $\frac{1}{3}$ the distance from β to γ , 1° *s.* of the line of direction. Omitted from the Maps S. D. U. K. and also from Malby's Globe Atlas.

173 H. I.—11h. 45m. 54s., N. $37^{\circ} 44' 28''$. A bright class-*nebula*, with a blazing centre, visible in moonlight; has a large apparent diameter between the Bear's hind-leg and the Hounds. In a blank region, difficult to find,— 17° due *s.* of γ , on the parallel of Declination. A line from γ carried to a point 1° following χ , and twice as far again, less 2° , will place it in the field.

194 H. I.—11h. 18m. 44s., N. $44^{\circ} 19' 42''$. A large elongated nebula, brightening towards the centre, its major axis running into star-dust. 4° *f.* and 1° *s.* of ψ 52, which is pointed at by δ and γ . The nebula closely follows 56. 56 is pointed at by the wide pair ξ and ν , in the Bear's hind-foot.

195 H. I.—12h. 0m. 8s., N. $43^{\circ} 48' 57''$. A bright nebula, pale, long and narrow. A wide double star in the field, behind the Bear's left hind-leg, 1° f. 67. A line from β just f. χ , and less than half as far again, will find it.

203 H. I.—11h. 45m. 34s., N. $44^{\circ} 54' 53''$. "A superb nebula, bright, very large, regular, 3' in diameter, very gradually brightening to the middle—is probably a globular cluster."—H. 1° f. the star 59, a little n. A line from γ over χ , and carried more than half the distance, will place it in the field.

205 H. I.—9h. 12m. 39s., N. $51^{\circ} 34' 19''$. A large elliptical pale and bright nebula, with its major axis lying n. p. and s. f. about 4'. In the Bear's right fore-leg, $1\frac{1}{2}^{\circ}$ s. p. θ , on the line to ι (Talita).

219 H. I.—11h. 17m. 23s., N. $39^{\circ} 30' 0''$. A small globular bright nebula, about $40''$ or $50''$ in diameter, before the Bear's left-hind leg. $1\frac{1}{2}^{\circ}$ f. 55, which is 5° n. of ν 54. There is another nebula designated 219 H. I. (see Draco).

286 H. I.—9h. 51m. 35s., N. $62^{\circ} 23' 22''$. A round nebula, with a bright centre. "On the n. f. side there is a faint ray interrupting the roundness."—H. At the back of the Bear's left-ear, closely following 81 and 82 M., a little s. Midway between 35 and 24, a little s. of the line.

Double Stars.

α 50 Dubhe.—10h. 55m. 23s., N. $62^{\circ} 28' 28''$. a $1\frac{1}{2}$ and b 8, both yellow; dist. $381''$. A fine star, with a distant companion, on the Bear's back. H. suspects a of variability. The foremost of the two well-known pointers to the Pole star.

β 48 Merak.—10h. 53m. 40s., N. $57^{\circ} 6' 19''$. a 2, greenish white; b 11, pale grey; dist. $75''$. On the Bear's body, the hindmost of the pointers to Polaris.

γ 64 Phecda.—11h. 46m. 43s., N. $54^{\circ} 26' 46''$. a 2, topaz-yellow; b 9, ashy pale; diff. in R. A. 15s.3. On the Bear's right ham, at the s. f. angle of the trapezium formed by α , β , δ , γ .

δ 69 Megrez.—12h. 8m. 43s., N. $57^{\circ} 46' 57''$. a 3, pale yellow; b 9, ash-coloured; diff. in R. A. 20s.4. At the root of the Bear's tail. Some observers consider δ variable from 2nd to 4th mag., and at long periods.

ζ 79 Mizar.—13h. 18m. 28s., N. $55^{\circ} 37' 45''$. a 3, brilliant white; b 5, pale emerald; dist. $14''\cdot 4$. A splendid double star. There is a distant bluish star with several faint companions; Alcor, 5th mag., is in the n. f. at a diff. in R. A. of 77s.5. Mizar is the second star in the Bear's tail. The large star a and Alcor constitute a double star to the naked eye, Alcor appearing as a faint companion.

θ 25.—9h. 23m. 49s., N. $52^{\circ} 17' 30''$. a 3, brilliant white; b 10, dusky; diff. in R. A. 51s.9. On the Bear's right fore-knee. A line from δ a little s. of β , and about $1\frac{1}{2}$ times as far, will find it.

η 35 Alkaid.—13h. 42m. 14s., N. $49^{\circ} 58' 57''$. a $2\frac{1}{2}$, brilliant white; b 9, dusky; diff. in R. A. 29s.3. A bright star, with a distant companion, at the tip of the Bear's tail; an important pointer to several telescopic objects.

ι 9 Talita.—8h. 49m. 57s., N. $48^{\circ} 34' 18''$. a $3\frac{1}{2}$, topaz-yellow; b 13, purple; dist. $12''$. A fine double star, discovered by H. "From strong impressions on his mind, confirmed by what he saw in the southern hemisphere, Sir J. Herschel supposes that certain very minute companions to stars may possibly shine by reflected light, and ι Ursæ Majoris is one of those instanced as having a dull satellite."—Smyth. In the Bear's right fore-paw, 1° n. p. κ . ι and κ form a wide pair of stars to the naked eye, pointed at by a line from a over ϕ and θ , or a line from β carried just s. of θ , and about half as far again, will touch it.

ν 54.—11h. 11m. 10s., N. $33^{\circ} 49' 51''$. a 4, orange-tint; b 12, cerulean-blue; dist. $7''\cdot 8$. A fine double star (a 5 and 6, greenish yellow; b 10, blue; dist. $4''\cdot 4$.—Bishop). On the Bear's left hind-foot, $1\frac{1}{2}^{\circ}$ n. of ξ . A wide pair to the naked eye, resembling ι and κ , suspected binary.

σ^2 13.—8h. 58m. 28s., N. $67^{\circ} 40' 54''$. a $5\frac{1}{2}$, flushed white; b $9\frac{1}{2}$, sapphire-blue; dist. $5''$. "The larger star greenish yellow, the smaller blue."—Bishop. A delicate object, suspected binary, on the Bear's forehead. A line from γ carried 1° s. of a , and 1° more than as far again, will find the group σ^1 and σ^2 .

ξ 53 Al. Ula Australis.—11h. 10m. 59s., N. $32^{\circ} 17' 39''$. a 4, subdued white; b $5\frac{1}{2}$, greyish; dist. $1''\cdot 8$ 1830, $2''\cdot 3$ 1843, $2''\cdot 9$ 1857.—Smyth. (a $4\frac{1}{2}$ and b 5, both of a yellowish tint.—Bishop). One of the most interesting of the binary stars, and one which has completed more than a whole revolution since it was first registered by H. in 1780. ξ Urs. Maj. was the first of the binary stars to which an orbit was assigned. The elements as calculated by Sir J. Herschel, Sarary, Mädler, and Captain Jacob, are strikingly similar. According to Jacob the perihelion passage occurred in 1816, period of revolution 61 years. ξ is easily found. A line from β over ψ , and as far again, will touch it where it is the south star of a wide pair (ν and ξ) to the naked eye, in the Bear's left hind-paw.

21.—9h. 16m. 3s., N. $54^{\circ} 35' 38''$. a 8, silvery white; b 9, violet; dist. $6''\cdot 3$. A fine object, on the Bear's left fore-knee, 1° less than half-way from ν 29 to Talita. $\frac{3}{4}$ the distance from ϕ to 18.

23.—9h. 20m. 50s., N. $63^{\circ} 39' 2''$. a 4, pale white; b $9\frac{1}{2}$, grey; dist. $23''$. A neat double star, on the Bear's neck, n. of θ , nearly on the parallel of Declination. Midway between ν and the group σ^1 and σ^2 , over the Bear's eye.

57.—11h. 21m. 47s., N. $40^{\circ} 4' 46''$. a 6, lucid white; b 9, violet, suspected variable; dist. $5''\cdot 9$. A beautiful double star. H. describes the small star as "a red point without sensible magnitude." On the Bear's left leg. 1° less than midway from ν to χ 63.

58 P. X.—10h. 17m. 27s., N. $53^{\circ} 18' 30''$. a 8 and b $8\frac{1}{2}$, both white; dist. $3''\cdot 6$. A very neat though minute double star, on the Bear's right-shoulder. It forms the f . apex of an equilateral triangle with θ and ν . A line from a over 39 (a star in the group p . β), and as far again, will touch it.

65.—11h. 48m. 4s., N. $47^{\circ} 13' 40''$. a 7, bright white; b $9\frac{1}{2}$, pale purple; c 7, white; dist. a — b $3''\cdot 8$, a — c $63''\cdot 5$. c is suspected variable. A fine triple star, on the Bear's left thigh. $7\frac{1}{2}^{\circ}$ s. of γ , nearly on the same parallel of Declination. 2° s. and 1° f. χ 63.

111 P. XI.—11h. 29m. 11s., N. $28^{\circ} 31' 44''$. a 6 and b 7, both pale blue; c 13, plum-colour; dist. a — b $1''\cdot 4$, a — c $17''\cdot 0$. A fine and delicate triple star, just midway between γ Leonis and Cor Caroli, $\frac{1}{2}^{\circ}$ s. of the line of direction. A line from γ Leonis carried 1° s. of 54 Leonis, and as far again will find it. Included in Leo on the Globe Atlas.

113 P. XIII.—13h. 23m. 55s., N. $59^{\circ} 37' 41''$. a $8\frac{1}{2}$ and b 11, both bluish; dist. $1''\cdot 8$. A close and fine double star, discovered by Struve; midway from Alioth to Thuban. In the field with 69 of Hevelius.

156 P. XIII.—13h. 32m. 18s., N. $51^{\circ} 24' 12''$. a 6, topaz-yellow; b 8, livid; dist. $1''\cdot 9$. A very close double star. "An exquisite object."—Smyth. Near the tip of the Bear's tail. 156 and 24 are pointers to the great spiral nebula 51 M., and they form a nearly equilateral triangle with Alkaid.

277 P. XIII.—13h. 53m. 58s., N. $53^{\circ} 45' 32''$. a $7\frac{1}{2}$, bright white; b 12, pale blue; dist. $6''\cdot 8$. A very delicate double star, a fine test-object, between the Bear's tail, and the right hand of Bootes. $\frac{3}{4}$ the distance from Mizar to κ Bootis.

URSA MINOR.

The constellation of the Lesser Bear is remarkable as embracing the pole of the equinoctial of the heavens. The Pole Star is $1^{\circ} 25'$ from the Polar centre. The central point of the Southern Polar region does not seem to be marked by any bright star in a similar manner—a circumstance of great disadvantage to navigators in the southern seas. The exact Pole may be found by drawing a line from Polaris to ϵ Ursæ Majoris. On this line and at about $1\frac{1}{2}^{\circ}$ distant from Polaris, will be found the polar point or great centre of the heavens to our system, the immediate vicinity of which is defined by a faint nebula and the little star *Blucher*. Ursæ Minor consists of twenty-four stars, of which there are seven principal; four of which, β , γ , η , and ζ , form a quadrangular figure; the other three, ϵ , δ , and α , forming a long curve representing the Little Bear's tail. The curve line extends from α to β . Polaris is of the same latitude as the place of the Spectator, when ϵ Ursæ Majoris is six hours' from the Meridian, as it is then at its greatest distance from the Meridian, and is on the parallel of R. A. with the polar point, and at a right angle with the arc of the Meridian. In A.D. 2095, the Pole star will be within $26' 30''$ of the true pole, which will not recur again for 12,860 years. "The period of the revolution of the celestial equinoctial pole about the pole of the Ecliptic, is nearly 26,000 years, so that about 13,000 years hence the north celestial pole will be nearly 49° from the position of the present pole star." "10,000 years hence, Vega will be the great polar gem of the northern hemisphere."—Smyth. The Little Bear is distinguished by a still more enormous length of tail than the Great Bear, by the tip of which, as if pinned to the polar point, he swings around the heavens once in the twenty-four hours, which circumstance will account for the ever-changing aspect of this constellation during the hours of night. Ursa Minor is encircled by Draco, the Camelopard and Cepheus.

Nebula.

250 H. Nova Polarissima.—R. A. 2h. 38m. 44s., N. D. $0^{\circ} 2' 53''$. A very faint nebula, gradually brightening to the middle, has a star of the 11th magnitude at its southern edge; remarkable for its proximity to the polar point. "I once more attempted to fix the place of a little star called *Blucher* by some of the *savans*, which precession will have now brought within $2'$ of the pole, but being only of the 10th magnitude it is a difficult object to touch in Right Ascension. A nebula like a dull star is perceivable near it, and is H. 250."—Smyth.

Double Stars.

α 1 Cynosura, Rucchabah, or Polaris.—1h. 8m. 54s., N. $88^{\circ} 35' 26''$. a $2\frac{1}{2}$, topaz-yellow; b $9\frac{1}{2}$, pale white; dist. $18''\cdot6$. A fine star, with a minute companion, on the tip of the Little Bear's tail; first discovered double by H. b is a faint object, and difficult to catch in a small telescope until once seen. It is nearly on a line from a to a wide double star which hangs by a chain of minute stars in the same field. There is a triangle of minute stars close to a , and a power of 30 will embrace about twenty-five faint stars in the field of the telescope; b is an excellent test-object for small telescopes. Rev. W. R. Dawes

saw it with a 1-inch aperture, power 80, but it must be noted, it was the diminished aperture of a large object-glass, which is a very different instrument from the 1-inch of a small instrument. Polaris is easily found from the two pointers β and α in Ursa Major.

β 7 Kocab.—14h. 51m. 21s., N. $74^{\circ} 42' 5''$. a 3, reddish-tint; b 11, pale grey; dist. 165". One of the "guards" or "guardians of the pole." On the Little Bear's left shoulder, easily recognized from its proximity to γ , the other "guard." β is pointed at by Mizar and Thuban, at less than the same distance beyond.

δ 23.—18h. 31m. 57s., N. $86^{\circ} 34' 33''$. a 3, greenish-tinge; b 12, grey; diff. in R. A. 53s.7. In the middle of the Little Bear's tail. α , δ , ϵ , ζ , and β , form a large curve, at the extremity of which hangs the parallelogram or trapezium formed by β , γ , η , and ζ . δ is the next star to α in the curve.

ϵ 22.—17h. 5m. 20s., N. $82^{\circ} 15' 2''$. a 4, bright yellow; b 12, pale blue; dist. 41". A star with a minute attendant, at the root of the Little Bear's tail. ϵ is the third star in the curve from Polaris, and nearly midway to β .

ζ 16.—15h. 50m. 51s., N. $78^{\circ} 12' 13''$. a 4, flushed white; b 11, bluish; dist. 310". A minute companion to b has been discovered by Rev. Mr. Challis, and there is a yellow star in the *s. p.* quadrant. On the middle of the Little Bear's body. ζ is the fourth star in the curve from Polaris, and the next to β .

π^1 and π^2 .—15h. 39m. 18s., N. $81^{\circ} 6' 0''$. a 6, yellow; b 7, blue; dist. 30". "To the *n. p.* of ζ , and in the mid-distance of a line drawn between α and γ of Ursæ Minoris, are π^1 and π^2 upon the flank of the animal. The first was discovered in 1782, and classed 90 H. IV., the components being of the 6th and 7th magnitudes, contrasted yellow and blue in colour, and 30" apart. The second (π^2) is an interesting object, being No. 1989 of the *Dorpat Catalogue*, and is so close as to be in contact."—Smyth. Not on the Globe Atlas nor on the Maps S. D. U. K.

5.—14h. 28m. 3s., N. $76^{\circ} 17' 50''$. a 4, fine yellow; b 11, plum-colour; dist. 45". A neat double star, under the Little Bear's body. A line from γ over β , and less than as far again, will strike it.

VIRGO.

One of the zodiacal constellations, distinguished chiefly by its wonderful nebular regions. Sir Wm. Herschel discovered no less than 323 nebulae within its boundaries. Admiral Smyth gives a diagram of a section of Virgo (*Cycle of Celestial Objects*), $2\frac{1}{2}^{\circ}$ *n.* to *s.* and 3° *e.* to *w.* in which 25 nebulae were congregated, and on the borders of the section mapped were located Nos. 84 M., 58 M., 89 M., 90 M., and 91 M. This extraordinary nebular region is marked out to the naked eye by the stars ϵ , δ , γ , η , and β Virginis, forming a semicircle to the east, while due north of ϵ , β Leonis marks the North-western boundary. Only a comparatively small number of the nebulae in Virgo can be brought within the reach of any telescope under a $3\frac{1}{4}$ -inch aperture refractor. Virgo rises in January, culminates in April, and sets in July. It embraces 110 stars. N. Coma Berenices and Bootes; E. Libra; S. Hydra, Corvus, and Crater; W. Leo.

Nebulæ.

35 H. I.—R. A. 12h. 8m. 53s., N. D. $13^{\circ} 54' 27''$. An elongated pale nebula, resembling a weaver's shuttle, lying across the parallel, with a central nucleus. On the upper part of Virgo's left wing; easily found, from the star 6 Comæ Bereniciæ, which follows Deneb, in Leo, by 7° , a little *n.* of the same parallel of R. A., and makes an equilateral triangle with that star and the star α 9, in the eye of Virgo. The nebula will be found 2° due *s.* of 6 Comæ, on the same parallel of Declination. 98 M. closely precedes this star.

43 H. I.—12h. 32m. 57s., S. $10^{\circ} 51' 58''$. A bright elongated nebula, in a fine field of small stars, supposed to be a flat ring seen obliquely. "Six principal stars form a great Y, with the nebula as the centre."—Smyth. Between Virgo's right elbow and the Raven. 11° *p.* Spica, 10° nearly due *s.* of γ . $3\frac{1}{2}^{\circ}$ *s.* of χ 26.

49 M.—12h. 22m. 52s., N. $8^{\circ} 44' 45''$. A bright, round, well-defined nebula, on Virgo's left shoulder; forms the *p.* angle of an equilateral with ϵ and δ . On the line from δ to Deneb in Leo, 2° less than half way, in a very crowded nebular region. 49 M. is marked twice on the maps S. D. U. K.

60 M.—12h. 36m. 48s., N. $12^{\circ} 17' 51''$. A double nebula, $2'$ or $3'$ from centre to centre, in the field with a low power. In the *n. p.* is 59 M. and in the upper part of the field is 1402 H. The bicentral nebula, 60 M., is situated nearly between two telescopic stars. Sir John Herschel concludes that the double nebula "may be stellar systems, each revolving round the other, each a universe according to ancient notions." This opinion seems like an abandonment of the nebular theory latterly adopted by his distinguished father. What H. sagaciously conjectured, the Earl of Rosse has since established, in the case of the bicentral spindle nebula H. 1905. "April 28, 1848.—The distance between the two nebulae greater than in H's. drawing. April 11, 1850.—The two nebulae not in a line, and a faint connection suspected; the distance between them is considerable. April 17, 1855.—The two nebulae are not in a line, *but parallel*; the distance between them is considerable, but a faint nebulosity suspected connecting them. May 8, 1861.—Sketched, axes *not parallel*, but inclined at an angle of about 16° ."—Lord Rosse, *Obs. Phil. Trans.*, 1862. Here is an instance where nature has been caught in the very act of the revolution of one nebula around another; the elongated spindle-shape of those objects enabling the observer to mark more easily their changes of position. "How much," observes Sir John Herschel, "is escaping us! How unworthy is it in those who call themselves philosophers, to let these great phenomena of Nature, these slow but majestic manifestations of the power and the glory of God, glide by unnoticed, and drop out of memory beyond the reach of recovery, because we will not take the pains to note them in their unobtrusive and future passage; because we see them in their everyday dress, and mark no sudden change, and conclude that all is dead, where we will not look for signs of life, and that all is uninteresting because we are not impressed and dazzled." "Such," concludes Admiral Smyth, "is the enthusiastic call of one, whose father cleared the road by which we are introduced to the grandest phenomena of the stellar universe." Omitted on the Globe Atlas and in the Maps S. D. U. K. Admiral Smyth gives a diagram of this double nebula, in the field with two others; four nebulae in one field of the telescope. The other two are 59 M., a small bright nebula in the *n. p.*

verge, and 1402 H. a small faint nebula. 60 M. is found $5\frac{1}{2}^{\circ}$ p. ϵ , and 1° n. of the parallel of R. A., $1\frac{1}{2}^{\circ}$ n. of ρ 30.

61 M.—12h. 15m. 1s., N. $5^{\circ} 13' 16''$. A large, pale, well-defined nebula, bright in the centre, and faintly seen as a bi-central nebulae, the nuclei $90''$ apart. A large serpent-like object, as figured by Lord Rosse, somewhat resembling 17 M., with three distinct nuclei, or knots, and nearly surrounded by a large circular nebulosity, H. 1196. It is found about 1° n. and a little f. the star 16. 16 is 4° due n. of η . 61 M. is midway from 16 to the double star 17.

70 H. I.—14h. 22m. 31s., S. $5^{\circ} 21' 55''$. A pale nebula, resolved into stars of 19th mag. by H. No. 1813. Over Virgo's left ankle. 4° s. of ϕ , and midway between ι 99 and μ 107, $3\frac{1}{2}^{\circ}$ f. ι , on the parallel of R. A.

75 H. II., and 74 H. II.—12h. 46m. 5s., N. $11^{\circ} 57' 43''$. Two nebulae in the same field. 75 is pale and elliptical, and resembles, as Smyth observes, "a paper kite." 74 is a round nebula, in the n. p. quadrant. The kite is placed under an arch of three telescopic stars, and its companion is preceded by two nearly vertical stars 10th mag, 2° p. ϵ , on the parallel of R. A.

88 M.—12h. 25m. 10s., N. $15^{\circ} 10' 12''$. A long spindle-shaped nebula, faint and pale; on the outer side of Virgo's left wing. In the immediate neighbourhood are the following objects of Messier's Catalogue shown by his $3\frac{1}{2}$ -foot telescope, and therefore accessible to a good eye and a moderate telescope: 58, 84, 86, 87, 89, 90, 91 Messier, with the following from Sir W. Herschel's Catalogue: 629 II., 161 I., 115 II., 116 II., 121 II., 122 II., 28 I., 167 II., 123 II., 124 II., 171 II., 172 II., 37 I., 35 I., 28 I. H., and these objects from Sir John Herschel's Catalogue: 1253, 1244, 1265 H. A line from θ Leonis carried just $\frac{1}{2}^{\circ}$ n. of Deneb and as far again, will fall short of 88 M. by $1\frac{1}{2}^{\circ}$.

98 M.—12h. 7m. 17s., N. $15^{\circ} 38' 51''$. A large elongated nebula, brightening towards the centre, between Virgo's left wing and Leo's tail, closely f. the star 6 Comæ Berenice, exactly on the parallel of R. A. On the Maps S. D. U. K. 98 M. is placed preceding instead of following this star.

99.—12h. 11m. 11s., N. $15^{\circ} 10' 36''$. A large, round, pale, well-defined nebula, in a small telescope.—H. 1173. One of the great spiral nebulae of the Earl of Rosse, resembling in its convolutions 51 Messier, more than any other object in the heavens, with these differences—51 M. is a spiral with two centres, and the coils are involved; 99 M. is a spiral from one centre, or if there be a second (as suspected), it has not been brought up to the eye so as to interfere with the convolutions from the principal centre, which are clear and decided. 51 M. is a right-hand spiral, but 99 M. is a left-hand spiral. There is a difference also in the inclination of the axes of position of the nebulae. The axis of 51 M. is oblique, while the axis of 99 M. is direct to the line of vision, and its coils at right angles thereto. "Spiral, with a bright star above, a thin portion of the nucleus across the star, and some distance beyond it; principal spiral at the bottom, and turning towards the right."—Obser. Lord Rosse, *Phil. Trans.* 99 M. is easily found, 1° s. f. 6 Comæ Berenice, nearly 7° f. Deneb in Leo. The pointer star, 6 Comæ Berenice, a 5th magnitude star, is about midway between ρ 30 Virginis and 93 Leonis.

100 M. 12h. 16m. 8s., N. $16^{\circ} 34' 16''$. A large round nebula, pearly white, off the upper part of the Virgin's left wing, accompanied by four small stars. 2° f. and 1° n. of 6 Comæ Ber. A line from Vindematrix to the star 93 Leonis, will pass over 100 M. in mid-distance. 100 M. is 11° s. and 1° p. 16, the lucida of Comæ Berenice.

Double Stars.

α 67 Spica.—13h. 18m. 6s., S. $10^{\circ} 27' 23''$. α 1, brilliant flushed white; δ 10, bluish-tinge; diff. in R. A. 19s.4. A very beautiful and brilliant star, in a clear dark field, apparently insulated. The recent discoveries of close companions to Antares, Procyon, and Sirius, excite expectation of the discovery of attendants to all the 1st magnitude stars. In Virgo's right hand. Forms a very nearly equilateral with Deneb and Arcturus.

β 5.—11h. 43m. 39s., N. $2^{\circ} 34' 40''$. α $3\frac{1}{2}$, pale yellow; δ 11, light blue; diff. in R. A. 13s. A fine star, with a minute companion; on the pinion of Virgo's right wing, 13° s. of Deneb.

γ 29 Porrima.—12h. 34m. 50s., S. $0^{\circ} 42' 34''$. α 4, silvery white; δ 4, pale yellow; dist. (1858) $3''.7$ ($4''$.—Dawes). One of the most interesting and remarkable of all the binary stars known. From 1718 to the present time, this beautiful double star has been an object of attention to observers; Pound, Bradley, Cassini, Mayer, Sir W. Herschel, Struve, Sir John Herschel, Bishop, Hind, and Admiral Smyth, have all made γ Virginis a particular object of examination. Admiral Smyth's devotion to this star has been the most unwearied, the most constant and faithful of all its observers; his observations extend over a period of 35 years. H. was the first to calculate its elements; he predicted that "the most striking phenomenon which sidereal astronomy had yet afforded, *viz.*, the perihelion passage of one star around another," would occur in 1834. Misled, however, by an early observation of Bradley's in 1718, he was in error about two years. The perihelion passage actually took place in 1836, and Admiral Smyth was justly rewarded by being the first observer of the extraordinary fact. "This was the most puzzling of all my double-star trials, for so unexpected was the phenomenon, that I gazed long and intensely before pronouncing it *round*, in the month of January (1836–06). I had an impression that the object was rather in an elongated form, in April, which impression was confirmed by the 21st of May. About this time I received a letter from the Rev. Dr. Robinson, of Armagh, informing me that he had no difficulty in elongating γ Virginis with Sir James South's large refractor. This was the first instance of a sidereal occultation that has been witnessed, and it still remains so. Several other double stars, we know, must have performed a similar ellipse, but they were not caught in the fact."—Smyth. An independent observation of Sir John Herschel, at the Cape of Good Hope, establishes the fact. "Feb. 27, 1836.— γ Virginis, at this time, is, to all appearance, a single star. I have tormented it under favourable circumstances, with the highest powers I can apply to my telescope, till my patience has been exhausted, but I have not been able to procure any decisive symptom of its consisting of two individuals." Periodic time of revolution according to the calculations of the following observers:—Sir John Herschel, 182 years; Admiral Smyth, 180; Mädler, 145; Henderson, 143; Smyth (in 1860), 148; Hind, from Smyth's Obser. 171; Do. from H.'s, 183; Adams, 174 years. γ Virginis is at the northern vertex of an equilateral triangle formed with Spica and Algorab (δ Corvi). It is the central and most southerly star of an inverted corona of bright stars, formed by ϵ , δ , γ , η , β , with Deneb in the vertex and Spica as a pendant.

δ 43.—12h. 48m. 33s., N. $4^{\circ} 7' 56''$. α $3\frac{1}{2}$, golden-yellow; δ $10\frac{1}{2}$, reddish; diff. in R. A. 5s.8. A wide double star, on Virgo's left side. 1° less than midway from γ to ϵ , and 1° f. the line of direction.

ϵ 47 Vindemiatrix.—12h. 55m. 28s., N. $11^{\circ} 41' 11''$. a $3\frac{1}{2}$, bright yellow; b 15, intense blue; dist. $229''$. A fine star, with a minute and distant companion. a is suspected of variability. Forms the f . angle of an equilateral triangle with η and Deneb in Leo.

θ 51.—13h. 2m. 57s., S. $4^{\circ} 49' 3''$. a $4\frac{1}{2}$, pale white; b 9, violet tint; c 10, dusky; dist. $a-b$ $7''\cdot 2$, $a-c$ $65''$. A triple star, on the lower part of the southern wing, just half way from Spica to γ , and 1° f . the line of direction.

τ 93.—13h. 54m. 47s., N. $2^{\circ} 11' 57''$. a $4\frac{1}{2}$, bright white; b $8\frac{1}{2}$, lilac; dist. $78''\cdot 6$. A star with a distant companion, a little over Virgo's knee. Forms the f . angle of a nearly equilateral triangle with Spica and δ .

ϕ 105.—14h. 21m. 15s., S. $1^{\circ} 37' 14''$. a 5, pale yellow; b 13, fine blue; dist. $5''$. A most delicate double star, on the skirt of Virgo's dress. A line from ϵ over τ , and half as far again, will find it.

17.—12h. 15m. 40s., S. $6^{\circ} 8' 28''$. a 6, light rose-tint; b 9, dusky-red; dist. $19''\cdot 8$. A neat double star, forms the p . angle of an equilateral triangle with δ and ρ 30. A little less than midway between σ in the eye of Virgo, and γ .

25 P. XIII.—13h. 7m. 52s., S. $10^{\circ} 38' 24''$. a $7\frac{1}{2}$ and b $8\frac{1}{2}$, both bluish; dist. $42''\cdot 4$. A wide double star, p . Virgo's right hand; $2\frac{1}{2}^{\circ}$ p . Spica, nearly on the parallel of R. A.

32 and 33 P. XII.—12h. 11m. 14s., S. $3^{\circ} 12' 15''$. a $7\frac{1}{2}$ and b $7\frac{1}{2}$, both silvery white; dist. $21''$. A fine double star, near the centre of Virgo's right wing. 3° due $\&$ of η Virginis.

44.—12h. 52m. 47s., S. $3^{\circ} 5' 32''$. a 6, bright white; b 13, blue; dist. $20''$. A delicate double star, $\frac{1}{2}$ the distance from γ to Spica, 1° f . the line of direction.

53.—13h. 4m. 52s., S. $15^{\circ} 28' 2''$. a $5\frac{1}{2}$, yellowish-white; b 15, bluish; dist. $45''$. b is a very faint and difficult object, 10° f . δ Corvi, nearly on the parallel of R. A. $\frac{1}{2}$ from Spica to β Corvi, 1° f . the line of direction.

54.—13h. 6m. 15s., S. $18^{\circ} 6' 31''$. a 7, pale yellow; b $7\frac{1}{2}$, pale blue; dist. $5''\cdot 7$. A neat double star, between Virgo's right hand and Hydra. $1\frac{1}{2}^{\circ}$ p . and $\frac{1}{2}^{\circ}$ s . of ϕ 1, the next object.

61.—13h. 11m. 23s., S. $17^{\circ} 33' 4''$. a $4\frac{1}{2}$, light straw-colour; b $10\frac{1}{2}$, pale blue; diff. in R. A. $2s\cdot 8$. 5° n . of γ Hydræ. ϕ 1, Spica and Algorab form a right-angled triangle, the right angle at ϕ 1. 7° s . and 2° f . Spica.

72.—13h. 23m. 23s., S. $5^{\circ} 46' 19''$. a $7\frac{1}{2}$, yellowish white; b 13, violet-tint; dist. $25''$. A very delicate double star, "extremely unequal, large star white, small one red."—H. Nearly midway on a line from Spica to ζ 79.

75.—13h. 25m. 39s., S. $14^{\circ} 40' 5''$. a 6, pale white; b 14, dusky; dist. $93''\cdot 0$. A star with a faint and minute companion, 4° s . and 2° f . Spica. A line from δ carried $\frac{1}{2}^{\circ}$ p . Spica, will touch it at more than $\frac{1}{2}$ the same distance.

81.—13h. 30m. 31s., S. $7^{\circ} 10' 55''$. a $7\frac{1}{2}$, bright white; b 8, yellowish; dist. $2''\cdot 8$. A fine and close double star, 3° n . and 3° f . Spica. A line from γ carried just n . of θ , and as far again, will find it. δ 1 is a suspected binary star.

84.—13h. 36m. 18s., S. $4^{\circ} 13' 21''$. a 6, yellowish; b 9, smalt-blue; dist. $3''\cdot 5$. A very close and exceedingly difficult double star, on the tip of the Virgin's left wing, where it forms a right-angled triangle with ζ 79 and τ 93, the right angle at 84. f . δ , on the parallel of R. A. by 12° .

85.—13h. 38m. 19s., S. $15^{\circ} 5' 13''$. a 6, white; b 16, faint; dist. $30''$. A most delicate and excessively difficult double star. " b the *minimum visibile* of my instrument."—Smyth. A line from θ carried just f . Spica, and as far again,

will touch a pair of stars, 83 and 85, 6th mag., visible to the naked eye. 85 is the *n. f.* of the two.

95 P. XIV.—14h. 22m. 59s., S. $3^{\circ} 38' 30''$. *a* $7\frac{1}{2}$ and *b* 12, both bluish; dist. $40''$. A wide and difficult double star. A line from Spica over ι , and $\frac{1}{2}$ the distance beyond, will show it, 2° due *s.* of ϕ .

126 P. XI.—11h. 31m. 30s., S. $1^{\circ} 40' 33''$. *a* 7, pale orange; *b* 12, reddish; dist. $5''$. A delicate and beautiful object, discovered by Struve; between Leo's hind paw and Virgo's wing, $1\frac{1}{2}^{\circ}$ *s.* of ν Leonis. A line from π just *p.* β , and as far again, will find it.

127. P. XIII.—13h. 27m. 23s., N. $0^{\circ} 22' 38''$. *a* 8, pale white; *b* 9, yellowish; dist. $1''\cdot 5$. A close binary star, period about 240 years. Discovered by Struve, closely *n. p.* of ζ 79. Midway between β Corvi and Arcturus, a little *f.* the line of direction.

143 P. XII.—12h. 31m. 47s., S. $3^{\circ} 37' 46''$. *a* $6\frac{1}{2}$, pale yellow; *b* 11, greenish; dist. $50''$. A wide object, on the centre of Virgo's right wing. A line from δ carried $\frac{1}{2}^{\circ}$ *f.* γ , and half as far again, will find it. On the line from η to Spica, less than $\frac{1}{2}$ the distance.

171 P. XIII.—13h. 36m. 31s., S. $3^{\circ} 35' 32''$. *a* 8, light orange tint; *b* $10\frac{1}{2}$, pale lilac; dist. $30''$. A delicate double star, midway on the line from Spica to τ , a little *p.* the line.

196 P. XII.—12h. 44m. 22s., S. $9^{\circ} 36' 12''$. *a* $6\frac{1}{2}$, topaz-yellow; *b* $9\frac{1}{2}$, lucid purple; dist. $33''\cdot 5$. A fine object, the colours in striking contrast. 1° *s. p.* ψ , midway on the line from θ Virginis to δ Corvi.

221 P. XII.—12h. 48m. 44s., N. $12^{\circ} 13' 50''$. *a* $7\frac{1}{2}$, pale white; *b* 9, sky-blue; dist. $29''$. A neat double star, 2° *p.* and 1° *n.* of ϵ .

238. P. XIII.—13h. 47m. 53s., S. $7^{\circ} 23' 34''$. *a* 7 and *b* $8\frac{1}{2}$, both white; dist. $2''\cdot 5$. A close double star. A line from γ Corvi carried just *s.* of Spica, and half as far again, will touch it where it lies, 1° more than midway from Spica to ι 99.

VULPECULA.

A small modern Asterism formed by Hevelius in 1672. While examining this part of the heavens, he saw a new star burst forth in the head of the Fox, which continued visible for two years. Flamsteed assigns 35 stars to Vulpecula. Rises in April, culminates in August, and sets in December. Lies in a rich portion of the galaxy. N. Cygnus; E. Pegasus; S. Sagitta and Delphinus; W. Hercules.

Double Stars.

6.—R. A. 19h. 23m. 5s. N. $24^{\circ} 23' 37''$. See Anser.

113 P. XX.—20h. 16m. 51s., N. $23^{\circ} 38' 52''$. *a* 8, bluish white; *b* 14, indigo blue; dist. $45''$. A delicate double star, in a group, $2\frac{1}{2}^{\circ}$ *n. f.* the point of the Arrow. A line from δ Aquilæ over γ Aquilæ, and 1° more than twice as far again, will find the object.

320 and 321 P. XIX.—19h. 47m. 26s., N. $19^{\circ} 59' 14''$. *a* and *b* both 7, and both white; dist. $42''\cdot 7$. A wide double star, closely to the *n.* of the shaft of the Arrow. 2° due *n.* of the nebula γ 1 M., which is between γ Sagittæ and

δ Sagittæ. "In the *s. p.* quadrant is a triple star, 10th, 11th, and 13th mag., which form 105 H. III., but the discoverer, as well as Struve, only noted two of them."—Smyth.

415 P. XIX.—20h. 1m. 18s., N. $20^{\circ} 42' 53''$. *a* 8, pale white; *b* 10, sky-blue; dist. $4''.5$. A delicate double star, close over the shaft of the Arrow; 1° *p.* θ Sagittæ, midway between β Cygni and β Delphini, in a gorgeous region of the galaxy.

Nebula.

27 M.—R. A. 19h. 53m. 44s., N. D. $22^{\circ} 21' 2''$. The Dumb-bell nebula, one of the very finest nebular objects in the heavens, presenting a larger surface to the eye of the observer than any other nebula in the northern hemisphere, excepting 51 M. There is a massiveness and tangibility about its appearance, even in a small telescope, that always makes it an especially favourite object with amateurs. Located in a splendid field of the Milky Way, embracing several double stars—easily found. A line from γ Lyræ over β Cygni, and carried just as far again, will place it in the field. The central portion is very much fuller than appears in the usual representations of "a double-headed shot," or "a dumb-bell nebula." A 4-inch aperture ought to show faint tracings of Sir John Herschel's figure, which elongates the object in a transverse direction, so as to show the major axis transformed into the minor. "There is a faint luminosity which fills in the lateral concavities of the body, and converts them, in fact, into protuberances, so as to render the general outline of the whole nebula a regular ellipse, having for the shorter axis the two bright masses of which the body consists, that is to say, the longer axis of the oval form, under which it was imperfectly seen by Messier."—H. "As the axis of symmetry or line through the centre of the principal masses is not less in apparent diameter than $5'$, the vastness of its extent is as utterly inconceivable as the dynamical maintenance of its form."—Smyth. The recent drawing of this nebula, as given by the Earl of Rosse (*Philosophical Transactions*, 1862), shows a most extraordinary object,—a vast oval mass with mottled and banded surface glittering with numerous stars, of which number 20 were measured and tabulated, which the nebula, as a whole, remains still unresolved. "This is a most difficult object; it requires an extremely fine night and a tolerably high power; it is then seen to consist of innumerable fixed stars mixed with nebulosity, and when we turn the eye from the telescope to the Milky Way, the similarity is so striking that it is impossible not to feel a pretty strong conviction that the nebulosity in both cases proceeds from the same cause. No stars have been inserted in the sketch which have not been measured, very many more were distinctly seen. The number of stars visible in this nebula depends even more upon magnifying power and distinctness than upon aperture; high powers obliterate the faint nebulous detail."—Observations of the Earl of Rosse. As this List of celestial objects was commenced by that magnificent nebula 51 Messier, so it may very properly conclude with its great rival nebula, 27 Messier.







